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CONTENT

A short overview for the cognition of the Internet of Things

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Abstract

In my articles I would like to provide a short general overview for the Internet of Things. It is one of the most commonly used terms of today, yet only a few have specific knowledge of the topic. Starting with the creation of the term, then standardizing it, and lastly filling it with contents. I introduce the complexity of IoT and the three different approaches. In the second part of the article I present the areas of its use preferred in Hungary, showing what an enormous role does IoT already play in our lives (e.g. building automation, safety technology, infrastructural services, transportation, eHealth, environmental protection, agricultural IT and consumer electronics).

Keywords: IoT, Internet of Things, overview

1. Introduction

The Internet of Things (IoT) is not a new term and also one of the most commonly used terms of today. However, for a lot of people it is still an inconceivable thing, and they do not know what it means exactly. What is the IoT about?

2. History of IoT

It is exactly as difficult to formulate as it seems. The term itself originates from 1999, but only in conjunction with barcode, QR-code, appliances accomplished with the help of RFID, and the identification of people. The creator of the term is Kevin Ashton. His notion was that with the help of this technology we could remove the burden of boring data recording tasks from the users' backs and leave them to the machines [1]. By storing all of the recorded data on the internet everything would be traceable and countable. It would be easy to check the date of production of a product, the next and already completed maintenance tasks, but we could also learn if the food is fresh, its expiration date, ad if it has been re-labeled.

Ideas were followed by actions, and the MIT established a research laboratory under the name of Auto-ID. With the participation of many noted universities and research institutes Auto-ID labs, an international research network was founded. This cooperation resulted in the founding of EPCglobal network in 2003, which was established for creating and standardizing the Electronic Product Code (EPC). The essence of the EPC in a few words is that every object has a completely unique EPC code, so they can be easily identified, and they can communicate with each other and also with the information systems. The goal was achieved in almost two years. The ITU (International Telecommunication Union) reported the achievement in 2005 in "ITU Internet report 2005: Internet of Things". [2]

3. Complexity

Now, that we are somewhat acquainted with the history of IoT, we did not get much closer to its meaning. Let's try to take it apart and try it that way!

After the publication of the ITU report researchers and companies started to work on the realization of these technologies, but different goals resulted in different notions. Very soon the sole standard was split into multiple approaches. In 2010 Luigi Atzori, Antonio Iera, and Giacomo Morabito's publication divided it into three big approaches: the object-oriented, the network-oriented, and the semantics-oriented. [3]

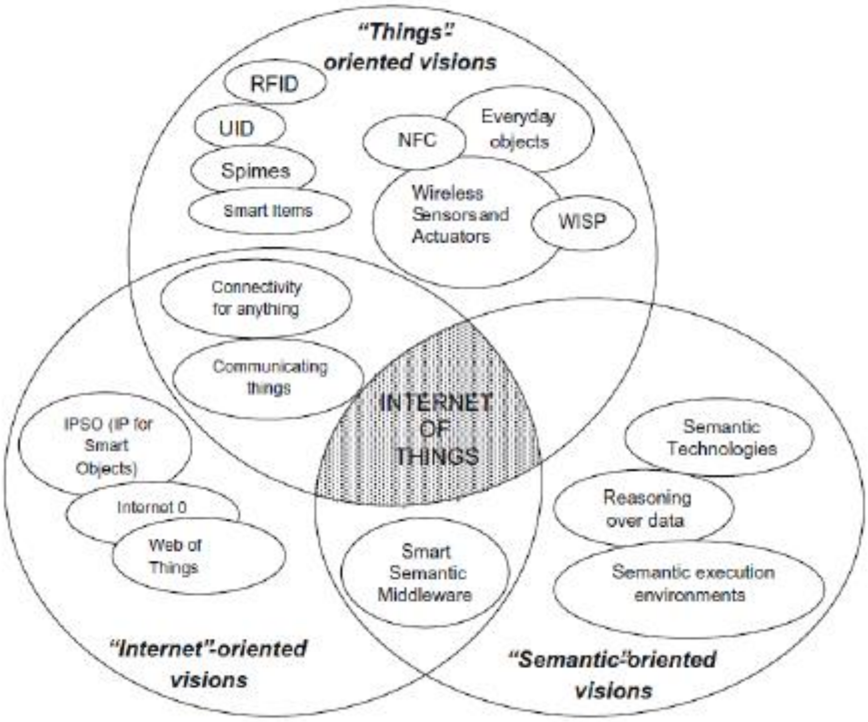


Figure 1: The convergence of different approaches [3]

Of these three, the object-oriented approach was the most developed, which is not surprising, because the concept of electronic product code is closely linked to it.

The second approach mentioned by the article was the network-oriented, from which the Web of Thing is the most commonly known. According to this theory every object should have an inbuilt computer connected to the internet. The third approach is the semantics-oriented, which emphasizes the conversion of the huge amount of data generated every day to information. Returning to the original thought, that instead of people, machines should record and process data. We may already hear an inner voice saying: Big Data.

4. Definition

In fact, we still did not make much progress. Let's try another common method, let's see what others have to say about IoT:

- According to the creator of the term: "The Internet of Things is can change the world, just like the internet did. Or maybe even more. [1]"

- According to the ITU: „It provides a worldwide infrastructure for the information society, which makes the use of advanced services possible between connected appliances (physical and virtual), with the help of already existing and developing interoperable information and communication

technologies. [4]"
- According to the publication which the subdivision was based on: "Objects have identity and virtual personality in an intelligent space, they use intelligent interfaces to reach and communicate with their environment and users." [3]
- According to Wikipedia: "The Internet of things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data." [5]
- According to IEEE: "The Internet of Things is a network that connects the individually identifiable "things" with the internet. The "things" have a sensor/operating part and they have the ability of programmability. Because of the individual identifiability and sensory the information is useful, the "thing" can collect and the "thing's" condition can change anywhere, anytime, to anything." [6]
Now it is getting clear that we are talking about networked things, electronic devices that collect data and communicate with each other and the user on an internet-based network. They have identity, meaning they can be individually identified. This way the data they collect can be identified in both time and space. The appliances are "intelligent", they are programmable, they have interfaces and sensors, and they can operate independently so they are some sort of computer. Their network extends to the whole world, they form a global system, and it has the possibility of changing the world in it, just like the interned did.

Perhaps we cannot get any closer to the term. If it was possible, probably somebody would already have put it into words before me.

5. Preferred areas of IoT in Hungary

Now that I roughly defined what IoT is, we should get clear about its role in our lives. It plays a much bigger part than we would think. We already went beyond that level we could see in the first season of The Big Bang Theory, when they switch a lamp on and off from China, Szechuan, and remote control a lamp with RC models from Austin and Tel Aviv "because they can"!

According to the study (Coordinated development of IoT and its dissemination in Hungary) published by the IVSZ (Society of IT, Telecommunication and Electronic enterprises) in May 2015 the preferred areas of the use of IoT are the following [7]:

5. 1. Automation of buildings

Domotics is the overall term for the automation, control and administration systems of buildings. The term itself was made by the connection of the Latin word domus (house) and informatics. It is also called home automation.

Figure 2: Possibilities of automation in a family house.
Source: http://domotika.com.mx/wp-content/uploads/2015/08/home.png

In this area the key is the coordinated operation of the automation system. It is not enough to build efficient cooling, heating and lighting systems in, they also have to be coordinated so they can work as a unity. This is where the IoT gains ground. If the standardized automation of buildings reach a critical level it opens new possibilities for providers. After the optimization of houses as island-like networks come system-level developments, but whole countries can be organized into one WAN platform.

The locally collected but centrally stored and analyzed data provides useful experiences for other industries. The system can also be used to prevent natural or industrial disasters by recognizing the data patterns in time.

5.2. Safety systems

Thanks to the high sensitivity sensors recording physical, chemical and biometrical parameters broad spectrum supervision is possible. With the help of high-definition cameras and fast data connection an efficient video surveillance system can be built also in areas without accessible wired infrastructure. In these areas apart from fixed sensors it is possible to use moving sensors, fixed to drones for example. Apart from security systems security system appliances used in areas of access control, identification, intrusion protection, and detection of foreign objects can also bring significant changes to the home and industrial segment.

5.3. Infrastructure service, energy sufficiency

Right now this does not mean IaS from cloud based computing, but the surveillance of utilities. From the perspective of providers monitoring given network sections, analyzing consumer habits, the effect of the weather and other conditions on consumption and the quality of service can be a tangible result of using the IoT. From the consumers' perspective it is mainly a comfort service, not having to check on the meters then read and report its position, the appliances do these things by themselves. The harbingers of this technology are the smart meters already in use. [8]

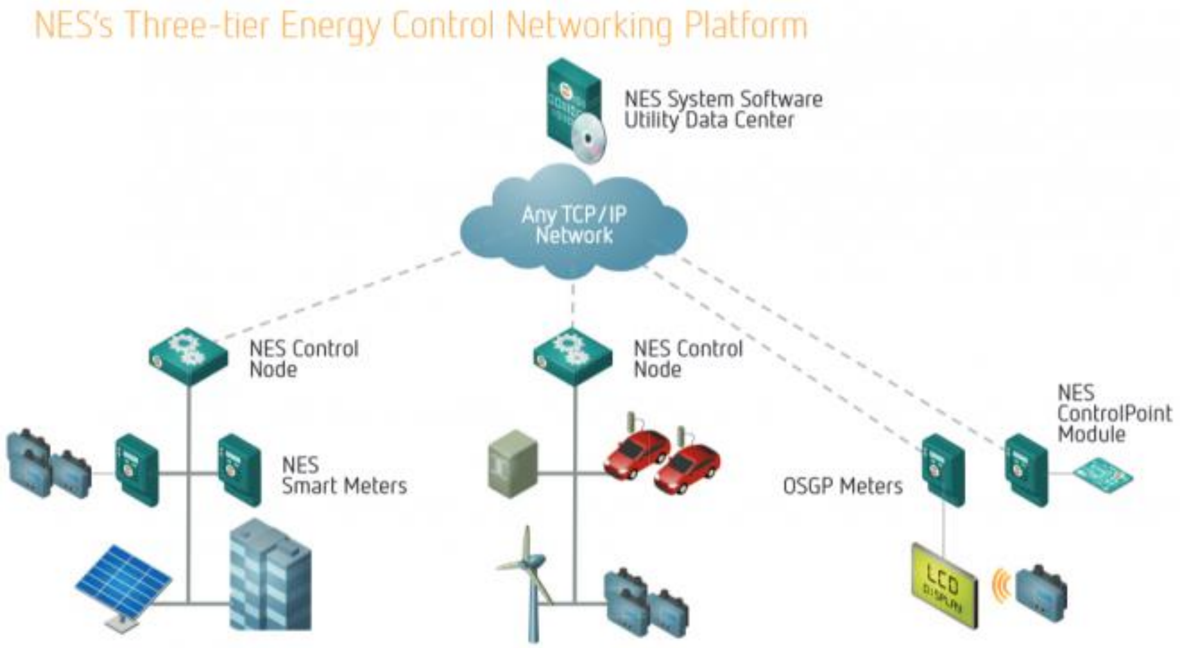


Figure 3 : Infrastructure services monitored trough a network

Source: http://snt.hu/wp-content/uploads/2015/03/NES_System_Software1-660x370.png

5.4. Traffic

Vehicles and road components communicating with each other mean a new perspective for the development of traffic and its safety. Traffic management improves, the permeability of roads grows, and the operational efficiency of vehicles improves. From the perspective of the passengers the comfort of travel increases, the adaptive system of the vehicle accommodates to the driver and the passengers. Safety can also be improved this way. A bus or a train can make individual decisions by collecting and analyzing data by itself, it can calculate the braking force and stopping distance based on fullness and GVW (gross vehicle weight). It can provide information about its arrival time based on traffic data. A functional example for the smart traffic – smart city concept is BKK's Futár project.

5.5. eHealth

Figure 4: Elements of the eHealth system

Source: http://www.ehealthireland.ie/infographic.png

The medical use of mobile technology, telemedicine services combines the tools of IT and mobile communication with the methods and appliances used in medicine. In the near future it can radically change the daily practice of prevention, diagnostics and therapy. Home measurement can reduce the workload of the doctors, providing a calmer environment for the patients. Constant monitoring provides a more detailed and accurate picture of the condition of patients. Constant data connection shortens the waiting time until an incidental intervention, and central databases provide a more accurate diagnosis. The can give an automatic alert for doctors on duty. A patient's case history would also be more easily accessible for the attending physician. Trough the high-speed connection, they can hold a video consultation with a specialist.

5.6. Environment protection

At first glance it may be not clear, but the possibility of utilization is there. Pollution is one of the biggest problems of today's society. Here it is very important to collect data from the biggest possible area as accurately as possible. IoT may be able to provide a solution for us.

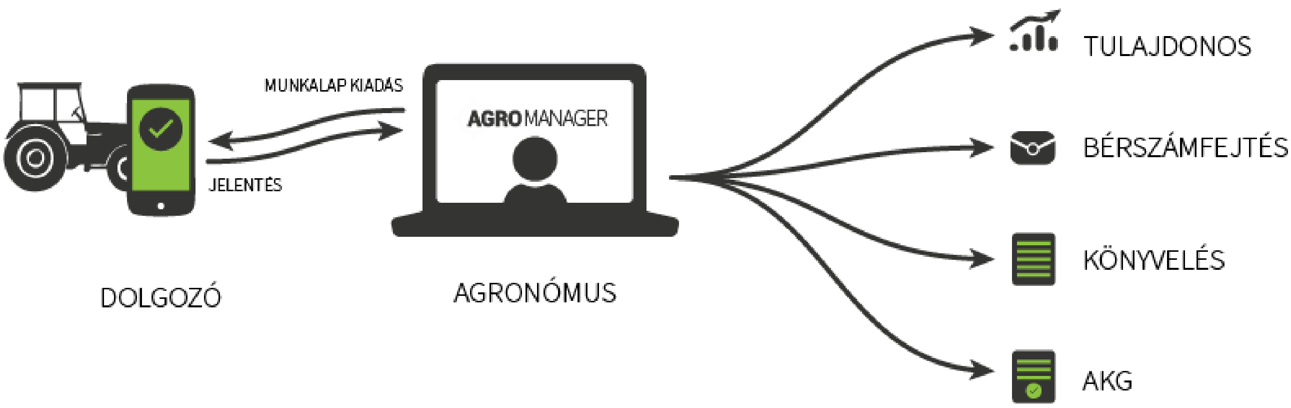
So far the size of the sensors and meters and therefore their price (larger material requirements) has been a problem. However, the development of technology and the miniaturization of sensors and network appliances led to the reduction of chips' prices, making it possible to create mass data collection networks. We can access more accurate information about environment in both urban and rural areas. Instead of the current meters with only a few test points for weather and air pollution, machines could be installed in large numbers to provide highly detailed information about pollution, temperature and dust. This information could be used in the areas of traffic, traffic control, and also in eHealth, in alarm systems. The key words are cheap and many, but small independent sensors.

5.7. Agricultural Informatics

Livestock breeding and crop production have been mechanized and automated for a long time now. This is a good base for introducing IoT solutions.

A good example is BovControll (https://www.bovcontrol.com/), which collects data about the animals with a smart collar equipped with Bluetooth connection and uses the information to provide predictions about the cows. Or when they analyze pigs based on pre-stored sound samples thus identifying the sick animals. In crop production up-to-date GIS information and weather prediction are needed. Where further development can be expected is soil analysis: monitoring and controlling nutrient levels and moisture and automated production.

Figure 5: Data flow of an agricultural informatics system



Source: http://agroinformatika.hu/img/process.png

Earthworks and the control of agricultural machines are also partly digitalized, tractors, sowing and harvesting machines are working based on a GPS sensor, many times without human intervention.

However, the real advantage is not local, enterprise-level use (just like domatics), but the creation of global systems. The resources needed for harvest could be reallocated, or determining tasks depending on weather conditions could be optimized. In the long run, cultivation suggestions can be made based on the condition of the soil.

5.8. Consumer electronics

Last but not least, the connected devices. Today the PC and the telephone serve as a junction; accessories are connected to and synchronized with them. These accessories are smart watches, odometers, e-book readers, cameras, navigation devices, photo frames, televisions, home network media players and online car systems. These devices must be easily operable and they must have a maintenance-free network connection, thereby being able to access online background services from anywhere.

Linear content service is losing its significance day by day; the Y and Z generation are characterized by constant online presence. Content consumption is accommodating to this, they want to learn about news and events right when they happen. They also choose on-demand services for relaxation, thus entertainment contents will increasingly rely on cloud-based services. The difference between this and the IoT services listed so far is that in consumer electronics the data traffic between the devices is significant, which means a different requisitioning for both devices and the network.

6. Conclusion(?)

We can see now that the IoT have already seeped into our everyday lives, and maybe invisibly, but it surrounds us. Day by day new technologies appear on the market and and conquer new areas of our lives. All this does not happen smoothly. What kind of technical difficulties may appear? To only name a few from the ever-growing list:

How to identify this many devices at the same time? In theory EPC was created for this purpose, but the internet is currently using IP addresses. The currently widespread IPv4 is already overwrought, the IPv6 intending to replace it has a seemingly limitless address pool. So which one would be adequate: EPC or IPv6?

How to move data between this many devices in a given time? IoT devices usually don’t move a lot of data, because the devices are not high-capacity, but the sum data traffic can be significant because of their abundance. Not to mention cloud-based services. Are today’s wireless technologies capable of forwarding this much data?

How to store this much data? Cloud-based service can be a solution for this. But whoever stored the data, the storage device has to be made by somebody, and somebody has to operate it. Can the industry keep pace with the increasing need for data storage? Maybe there will be a technological breakthrough and storage will be places on atomic levels? [9]

Who and how should process the data? Not only the quantity, but the diversity, different speed of arrival and authentic of the data is also an issue. Bi Data can be a solution for this. But who will give an answer to the questions of Big Data?

And if it is not me, who stores my data, but an outside partner (provider): who can access it and with what kind of permission? This is not only a technological, but also a legal issue.

In conclusion, better if we get in touch with the idea and prepare for handling these problems!

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Firtst results of automatizing the unit management system in the US Army II.

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Abstract:

This article is the next partial result of a planned long-term research. The ultimate goal of the research is to present a history of the REVA service from the perspective of technical devices. Continuing the previous part, this article presents the artillery subsystem (TACFIRE), one of the three subsystems of the field army automated command and control systems in the US Army, and some other artillery systems and this article presents the Combat Service Support System (CS3), one of the three subsystems of the field army automated command and control systems in the US Army, and some other the military supply system to automate tasks.

Keywords: computers, information, management, history

The large scale scientific and technical improvement of the decades following World War II had a great impact on the weaponry and other technical tools of the army. This huge technical improvement resulted in such fast locomotion in military affairs too, that the registration and evaluation of the combat situation was only possible through the process of large amounts of data, however, that couldn't entirely be done manually. Most forces, but especially the ones of leading world powers made great efforts in researching the usage of electronic computers on the field to solve this problem. Automatizing the duties of the artillery received special attention, because these duties always included processing large amounts of data.

The aim of this article was to present the Tactical Fire Direction System of the artillery (TACFIRE), but primarily from the perspective of the IT devices facilitating automation. I was trying to present the duties of the artillery to an extent that helps the presentation of the technical background and provides a basis for future analysis. It was my sub-goal to introduce a new possibility for automatizing military activities which can be an example for the Hungarian military leadership.

In the second part of the article I present the third main system of the data processing system of the US ground forces, the Combat Service Support System (CS3), primarily from the perspective of the IT devices facilitating automation. In this part of the presentation too I was trying to introduce the duties of the military supply service to an extent that helps the presentation of the technical background and provides a basis for future analysis.

In addition to these the aim of the article was to also introduce and analyze the contemporary American and Hungarian principles which had an impact on the control of automatization and the vision.

The beginnings of automatization in performing the duties of the artillery

In ground units the automatized team management system of the field (all-arms) army had three subsystems: Tactical Operations System (TOS) and the aforementioned TACFIRE and CS3. From these the TACFIRE, despite its name containing the word 'tactical' based on further interpretation used in the US Army, was an operational-tactical automatized fire direction system.

The operational-tactical automatized fire direction system was an integrated electronic computer system working in on-line mode, which was made suitable for operation in field conditions from 1971 to 1974 and was adapted in the artillery units of the ground forces.

The development of the TACFIRE began in the beginning of 1960 within the framework of an artillery live firing codenamed “White Plan”. The drill sequence held in Fort Huachuca (USA, Arizona) was intending to examine the possibilities of the usage of electronic computers in firing tasks in the artillery.

Based on the experiences in the end of the drill sequence the composition of the TACFIRE system was defined, which was approved by officials in January 1966. They entered into contracts with the manufacturers of electronic computers selected according to the approval until December 1967. The contracts included development, production, the trial of the developed system in field conditions, the direct participation of the producers and the army in experiments, and they specified the service and technological requirements for the experiments. For one of the main goals of the program they specified the creation of a universal military electronic computer that could also be used in other data processing systems (mainly TOS-75) of the land forces.

Trough automatic data processing the system served as a great help for artillery commanders and their staff in carrying out their tasks. The authorized electronic computers were able to reduce the workload of the computing and information processing tasks of the artillery, which was mostly done manually until then. The goal of the system was to increase the efficiency of the artillery support while enhancing the accuracy, be able to process and use the information concerning the targets fast and well, reduce the reaction time, to assure bigger efficiency in determining the ability to fire and the distribution of the targets among the artillery sub-units.

Using the automatized data processing technology the automatized fire direction system could help completing the following tasks of the artillery:

- technical preparations
- artillery fire detection
- artillery inspection
- fire control
- fire planning
- processing meteorological data
- registering the status of the ammo
- registering the position of artillery units

The large scale scientific and technical improvement of the decades following World War II had a great impact on the weaponry and other technical tools of the army. The ever-growing amount of information required – taking advantage of the large technological improvement – the commencement of automatization of completing tasks in military affairs too. Great efforts were made to examine the usability of electronic computers on the field in favor of solving the problem. Automatizing the duties of the artillery received special attention, because these duties always included processing large amounts of data, one of its systems was the TACFIRE.

In conclusion we can say that this chapter only offers a general description which, however, shows that there is no change in the tasks of the artillery, so the amount of data to process will continue to constantly grow. It follows directly that the development of the technical tools of automatization will continue to be on the agenda.

Technical background of the TACFIRE-system

Let’s take a look at what parts was the TACFIRE made of and what parameters did it have. The nerve center of the system was the third generation computer manufactured by the Control Data Corporation (CDC), which besides being designed for military use also made the further increase of the available capacity possible.

The question may arise that why did the CDC get this order from the military. The computer manufacturing company was one of the bigger American computer companies which were well known and honored in the USA in the 1960s. The others (IBM, Burroughs Corporation, NCR, General Electric, Honeywell, DEC, RCA and UNIVAC) could also boast significant results. The background of the decision if of course not known, but it is a fact that the CDC already made the Naval Tactical Data System (also known as NTS), which after its introduction in 1950 was successfully used as an information processing system by the US Navy until 1960. It is also a fact, that the CDC considered IBM to be their biggest rival, and it was one of their principles to produce 10% faster devices 10% cheaper. (Cheaper manufacture could be a determinant factor because after World War 2 the military had a smaller budget). It could also influence the decision that the TACFIRE was part of the Automated Data Systems within the Army in the Field (ADSAF) it adjusted to the other important part, the operational-tactical control’s automatized data processor system (TOS), whose core was provided by a CDC 1700 type supercomputer.

Naturally this would be too much of an easy answer to the question, especially knowing that the third system belonging to ADSAF, the logistic supply's automatized data processing system, the CS3 used IBM computers. However, it can be safely stated that the CDC developed the computer on the picture below in 1964 under the name CDC 6600, which may not have been the cheapest, but it was surely the fastest computer of its time. The 6600 CP (Central Process) containing 10 parallel functional units was able to process multiple commands at a time. Today this is the superscalar design, which was unique in its time.

The acknowledgement of the CDC6600 type computers' achievements was indicated by the fact that the institution dealing with the analysis of the USA's defensive problems stated referring to their own research that by 1975 bodies of the Department of Defense will need 125 computers like this only for the elaboration of meteorological information.

After the analysis of the financial and economical background of the beginning of the automatization let's move on to the analysis of the technical background. To every computing center belonged an artillery control desk, which provided the program's supervision for the operating staff. This appliance was able to draw up messages during the input to the computer, the highlighting of the supplied data according to the messages, and it could also retrieve them, put messages and data in the computer and indicate mistakes. For filling the computer's internal memory and for the containment of large amounts of data they used external memory devices which were most likely drum or replaceable disk memories. In every computing center a line printer was placed. The line printer was directly attached to the output of the computer and provided necessary amounts of prints of the stored data. For the depiction of the current combat situation they used a digital map drawer attached to the computer, which had pages sized 122x122 centimeters. In higher level artillery centers they also installed a CRT indicator to the map drawing unit. This appliance was also operated by the computer and it was used for magnifying certain parts of the map.

Outsourced message input units belonged to the system, which could transmitted the data to the computing centre from great distances. Two types of these were developed. The standard shaped message input unit was a small sized, portable appliance, which were installed at forward observers. The messages were forwarded as a digital sign via the ground radio or telephone news system to the computer. The variable shaped message input unit provided transmission without the use of the standardized form trough radio or telephone. To the artillery batteries they provided the needed information visually represented. The connection of the news system with the computer, the input units, the electronic plan boards, and coder tools was possible trough the data input terminal.

The system's software consisted of such computer programs that provided the possibility of completing artillery tasks. In line with the tasks the application of the software happened in different areas:

- utilities (translation programs);
- controller programs operating peripheral units;
- programs completing TACFIRE's tasks, which made the constant supervision of the program possible, and also the indication and elimination of malfunctions and their causes.

First the camp artillery units, then the division artillery strains were equipped with the TACFIRE system. The other elements belonging to the artillery units and division artillery strains (forward observers, exploratory groups, meteorological departments, etc.) were connected to the computing centers with input/output tools. The system was connected in the camp artillery's news system. The transmission of the digital and analog signals was provided based on time-sharing.

The time-sharing allows the sharing of the computer's sources between multiple users and/or processes trough a possible method of multitasking. During the time-sharing a central server distributes its sources between the users/processes by assigning "time slots" to every user/process. If the time slot is chosen, the machine runs the program of the user assigned to it, but only if it's not currently carrying out input/output activities.

The pace-setter module of the operation system controls the distribution of the time slots between the users. If the control picks a certain user, then the pace-setter sets the new or saved program parameters and starts running the certain program. When the assigned time slot expires it stores the metadata, then it could retrieve the program with it.

The length of the time slot depends on the number of users and the other parameters of the system; usually it varies between a few milliseconds and a few hundred milliseconds. The implementing of the time-sharing was made possible by increased speed and the realization that while the currently running program is waiting for the user, the machine in fact is not doing anything, so these times are unproductive, and could be used for other purposes. The possibility of reaching the mainframe (computer networks) from a great distance also had to be provided.

The TACFIRE system was installed to S-280 type cross-country vehicles with a container-like solution, which provided running order, deployment, fast reaching of viability and also transportation on land, water and air.

The TACFIRE appliances of the artillery unit were installed to one, and the appliances of the divisionary staff were installed to two S-280 vehicles. According to the plans the system also provided help for the tactical-operational center's fire support element in the preliminary aim analysis and in the prediction of the nuclear waste's fall-out.

The operation of the system is not complicated. The forward observer, with the help of a message input unit trough the connection of the camp radio or telephone, transmitted the request related to induction of fire to the computer in the fire control central of the artillery unit. The computer analyzed the aim, calculated the ballistic data and compiled the advised fire order or fire orders. After this the computer marked the location of the aim on the digital map drawer, and gave the fire order on the control panel. The report of the forward observer reached the control desk in the duration of 6,3 seconds. If the fire controlling officer decided to ignite fire, the computer forwarded the fire order in the form of a digital signal to the battery which's cannons had to fire.

The fire control officer was of course able to change the input data anytime, however, this meant that the computer had to work out new commands and instructions. The computer automatically transmitted the commands to the computer placed in the division's fire control center, where they were registered for fire planning and aim registration purposes.

The problems and possibilities of the automatization of logistic supply tasks in the 1950s and 1960s

The principles

The third main system of the US land forces' data processing systems was the CS3. The system was created with the intention to satisfy the needs related to the automatization of basic data processing systems in both war and peace. In the 1950s it was already stated that the possibility of fixing logistic supply operations can be provided by the usage of automatic data processing systems in personal, administrative, accounting and supply areas. The CS3 was based on the principles and methods already in force. They offered a completely new perception in the area of logistic supply data processing rather than support methods. The aim of the system was:

- to increase the influence of the all-arms commanders by decreasing the amount of administrational work in supply, personal, and administrative issues;
- to offer an opportunity for the maximal usability of the tools at hand by decreasing the demand for human resources (conditions);
- the appliance to be able to respond to the informational demand of superiors in high-speed.

The system's creation made the automatization of the following areas possible:

- financial and technical preparedness of the troops
- making systematic and special reports
- financial management
- military salaries
- military police service
- reporting losses of manpower
- medical service
- any material supply
- financial preparedness, being stocked up, and maintenance service
- technical constructions
- army-scale transportation

The Hungarian political and military leadership also recognized that for waging modern wars the usage of great amounts of military technology is necessary, which is only possible trough the automatization of the management. The problem of management mechanization was of particular importance for the logistics supply, because the data communication tasks occurred in great numbers. The increased requirements for the logistics supply management were unanimously concerning every process of the management, which were summarized in the following:

- clarification of the task, collecting data related to logistics supply;
- fast and punctual processing of the data at hand;
- decision making for the logistics supply;
- operations related to the logistics supply, fast transmission of commands to the ancillary;
- registering of tasks, supervision of completed tasks;
- analyzes, drawing conclusions based on the completed tasks.

All these tasks were such a major burden for the management that modern mechanical and automatic management systems became essential. The good example was before the eyes of the Hungarian management of logistics supply, because the automatization of the fire control and the mechanization of the movement of troops were relatively advanced. Naturally the improvement of leadership tools was not able to provide the fast fulfillment of logistics supply tasks by itself.

Step by step, in parallel with the modernization of management tools the forms of the logistics supply management corps had to be improved, and changes also had to be made in the staff of the logistics supply troops and the organization of work (the two latter were not part of this article).

The tools

Functioning as a part of the automatic camp data process system of the USA ground forces the base of the logistics supply's automatized data processing system was a camp edition IBM 360/40 computer, which was built in to a trailer just like they did with the TOS. The following units belonged to the IBM 360/40 computer's system in the US ground forces:

- IBM 2040 central data processing system.
- IBM 2540/1 punch-card reader/puncher unit.
- IBM 1403-N1 line printer unit.
- IBM 2821 control unit for controlling the line printer.
- IBM 1443-N1 line printer unit (printing 600 lines or 10 pages in a minute).
- IBM 2520 punch-card reader/puncher unit.
- IBM 2314 changeable disc storage unit.
- IBM 2401 magnetic tape storage unit.
- IBM 2702 data transmission supervisor unit (the 2702 could accept up to 31 communicational lines, but slower than the 2701).
- IBM 1012 perforated tape punching unit.
- IBM modulator-demodulator unit.
- IBM 557 punch-card puncher unit.
- IBM 029 punch-card puncher unit.
- IBM 059 punch-card supervisor unit.
- IBM 1056-1 card reader unit.
- IBM 1013 punch-card transmission terminal.

- IBM 1051 supervisor unit.
- IBM 2740 informant terminal.

The computer centrals and various data transmission stations were compiled from these units and appliances depending on the application (army, corps, and divisions). The building of the system made land, air and water transportation possible.

The testing of the system took place at the 3rd army corps stationing in Fort Hood. The 1st and 2nd armored corps were each given a computer to try. The employees of the IBM corporation took part in the experiments as the hardware's transporters and the employees of the URS corporation who tested the transported softwares.

In Hungarian relations in the beginning of the 1960s significant arrear could be experienced in the areas of automatization. In means of the automatizaton of logistics supply two basic functions were involved: management and data communication. In the areas of simplification of management, the recording and storage of data certain accomplishments were already made. Such as:

- formation of operative registers;
- unification of mobilization plans;
- formation of the content and form of reports and commands;
- preparation of coded data transmission.

The used technical tools were tabulated according to the following considering the tasks to be carried out:

- Sound recording (magnetophones, Dictaphones). Aim: reporting and reconstructing measures and reports with portable appliances made for military use.
- Transmitting graphic data (picture telegraphs). Aim: speeding up the data transmission from the command post to the logistics supply point. Encryption was not possible.
- Sound-based data transmission (wired dispatcher and radio dispatcher). The wired dispatcher system could not be used on the move. The radio dispatcher was restricted by the danger of wire-tapping.
- Automatic encryption technology (perforated tape appliances) (hectographs and document photo applications). Colored copies of a graphic document could be made in the duration of

2-3 minutes with a colored duplicator. Tempocop copy machines were used to make black and white copies in 1,5-2 minutes.

- Registry appliances (edge punch-card registry pages). On the edge of the paper classification, manipulation openings were placed, so they could be summarized fast after settlement. It was first used by the transportation service.
- Tabletop mechanic, electromechanic calculators. They were able to carry out four basic operations in operational conditions. The results were recorded on a punch tape and forwarded to a data processing center. The next step were accounting automats which could also carry out more complicated accounting tasks.
- Tabletop electronic computers (IME-84, HUNOR-131 and their descendants).

Conclusions

The main aim of this article was to introduce the TACFIRE system, but mainly from the viewpoint of IT appliances' automatization. The tasks of the artillery were introduced in a level that helped to present the technical background and served as a base for the following events.

My aim was to demonstrate the technical environment trough the presentation of automatization endeavors in which later the REVA service was born. The process of the improvement can be easily followed up in those times and today too, so I'm planning to write additional articles in the topic of automatization of the artillery.

The second main aim of the article was to introduce the USA land forces' camp data processing system's third main system, the CS3 system, but mainly from the viewpoint of IT appliances' automatization. All this was limited to a certain part of the technical background, which was used to introduce and analyze the American and Hungarian principles and methods influencing the directions and future of automatization. Besides these I made a short outlook on the calculator (computer) market of the 1960s, and I introduced the beginnings of the Hungarian development trough the short presentation of the HUNOR machine-family.

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Make your digital life portable
(Usage of portable applications in our everyday life and in the army)

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Abstract

Satisfaction that IT and the user need can be provided by a software, that does not require excessive competence and yet we can use all of its functionality along its complexity. The PortableApps platform offers the opportunity to use programs alternatively while providing a platform free of charge. Due to its portability, rich services, up-to-date functionality and ease of use, it is the most ideal choice for everyday use.

The purpose of this article is to provide a broad introduction about the capabilities of the portable applications, PortableApps.com platform. In addition to this to compare them with traditional applications in order to increase its popularity among everyday PC users.

Keywords: portable applications, easy handling, Smart Defence, effectiveness, PortableApps platform,

Introduction

Nowadays, people use variety of computer software to facilitate countless tasks. There are some of these, which occur very often, practically on every computer. Who would not use a browser program in the complex world of the Internet, or who does not need an office suite? But we can also see that it is not really a particular software, but a function provided by a software group.

Based on an article of the CERN's IT department [1], six general functions appear:

- E-mail client
- Web browser
- Office software
- PDF Handler
- image editor
- antivirus

However, if you think outside of the general user's vision, plenty of features will appear such as developer environments, remote access, multimedia applications, various security software, and specialized software tools.

There are numerous free and commercial software that are designed for different platforms to implement these features. However, there are free softwares for almost any operating system to accomplish a single function. Although these have their own disadvantages, it is worth examining their usability.

A newly purchased computer is usually delivered with a pre-installed Windows operating system. If you want to use each application in the system in a legitimate, unfounded state, you can do it with either significant cost or with the usage of open source softwares. Using illegally acquired(pirated) software - though it is widespread and typically unchecked - violates copyrights and implies criminal liability [2].

It is typical of an average user's IT practice that they do not use each and every feature of a certain software. The commonly used abilities can be found both in free and commercial softwares. Examples include Microsoft Word and LibreOffice Writer. Both are full-featured word processing applications with nearly the same capabilities [3] and with the difference that LibreOffice's product is freely available.

However, due to the many features, commercial software takes considerably more space on the mass storage. Take the most popular image editing application, for instance. Photoshop needs storage space of about 2.3 GBytes, while the different versions of GIMP range around 250 MBytes.

An even more serious problem is the harshness of license contracts. If only one installation is allowed with the purchased license, you can only use the program on a single machine. New purchases are required for additional copies.

The project, document or presentation made will obviously be displayed in the user's official environment. If the format is not supported by a given system, prior to the technical "juggling" before the presentation, the creator may become a subject to a disadvantageous judgment.

You may also come across that a user does not want or can not take his/her computer with him/her. The computer may have an internal failure, which can embitter the owner's life.

The problems listed above can be solved by a very promising idea and a constantly evolving environment, the PortableApps platform. This solution allows us to bring all important features, applications and settings virtually on any PC running Windows or Linux operating system. As a result our computer will always look and work like ours.In addition to this it will always consist our settings and applications as well. This great mobility and freedom will be explained in a more detailed way in this paper.

The PortableApps platform

There are two main recognizances of portable applications by definition. First, they can be moved easily across different computing environments, so they do not need installation. Second, after closing the app, nearly no trace is left behind on the host, because the configuration, files, and data are all stored in the applications folder. Thanks to these aspects, portable applications can run independently from the host operating system. This kind of software can be obtained, installed and managed by the PortableApps platform.

Why is it hard to find and download apps that you like and then place them on a pendrive? The searching and maintaining procedure of the software will cost a lot of work, and we might not get what we expected. Someone had already gone through these problems and realized that there is an easier method. That is what the platform does: it makes things easy for us. What we need: a thumb drive or a cloud-based storage, a stable Internet connection, and a computer running Windows. As a first step, we need to get the platform setup from the official website and then install it on a media we have chosen. During installation, you can select which applications you want to place on the storage and then let the platform do its work. The waiting time depends on the speed of the Internet connection and the total size and number of programs selected. After the installation is completed, we can use the applications. However, if you want to store the apps in the cloud, there is one step to be made. We need to synchronise the installed folder to the cloud, and also to all applicable computers. (For differences in the usb drive and in the cloud, see Chapter 3)

The platform has four major positive features. First, unlike many other similar platforms, when installing the PortableApps platform, only the selected and necessary softwares are installed.. Secondly, all the settings and configurations associated with these softwares are located in a folder. Each application has its own one, that remains same on every computer. These configurations are not compromised by software updates either. Third, the platform has its own update system. The built-in updater automatically searches for new versions and warns you. Downloads and installs are only done with the permission of the user. Fourthly, menu system is provided, which is similar to the windows start menu. Along with number of useful features such as search engine, appearance settings, and other platform-related tools.

In addition to the previous statements, there are a plenty of additional benefits. The main source is its own online software center. Only verified, unmodified software is added to the control panel, and the organization claims that the applications they provide that are completely safe. The source code for applications is downloaded in a compressed form, with all of its benefits. In the case of license agreements, the organization undertakes to ensure that all software provided by them is open source and free.

By comparing platform solutions with stand-alone search and installing, we can clearly see that the benefits of this platform is indisputable. The main threat to portable applications are the ones, which are produced by individuals, owing to the fact, that most of them are from uncertain source. It may happen that the creator of a certain portable app wants to abuse the goodwill of a user by a hidden modification in the code. An unsuspecting user can install malicious software on the workstation without unintentionally. The platform, however, with its internal security mechanism prevents the corruption of its software, so they can be obtained in their original form. Another security feature is the searching mechanism of the platform which updates the latest version of the application. It can fill the security holes, so the vulnerabilities can be fixed almost instantly. In addition, the security of our software is also guaranteed in a way that the platform automatically detects unwanted changes after the installation on the pendrive. It can detect even the changes in the Autorun file and instantly alert the user. Finally, the platform's software archive contains an encryption program called VeraCrypt. Using this, you can create an encrypted volume in the root folder of the pendrive, and the documents created by the applications can all be placed in this encrypted container, carefully locked away from curious eyes.

Overall, PortableApps platform uses most of the benefits of portable applications and with all its tools it creates an easy handling environment for the users. Despite its extraordinary lightness and affordability, it provides the user with a sufficiently secured environment. These features make the platform even applicable in military environments.

Do it yourself

We can create Portable applications for ourselves. Regardless of the manufacturer and the size of the software, there is a specific application, which enables us to create our own portable app. With Cameyo (which also does not need installation), we can run our favorite software even through a browser. However, its most significant function is the traditional-to-portable conversion.

Using it does not require any special IT skill, only basic knowledge of virtual computers, because the conversion has to be done on an intact virtual machine. After launching Cameyo, select "Capture the installation" and then install the selected software after start of the recording. When the installation is completed, it will stop recording. The portable program we just made is stored in the user folder \ Documents \ Cameyo folder. The program's key aspect is that it is portable as well as freeware, thus it can be used freely. Due to its easy handling, it does not require a great deal of expertise. The only disadvantage is the high time requirement. We have to wait a lot to start recording and to create the portable application itself. The time also largely depends on the size of the chosen software.

Comparison of different media

The PortableApps.com platform can now be installed on two media, cloud and pendrive. (There is a possibility of installing directly on the computer, but this is irrelevant for the article.) Both solutions have their own advantages and disadvantages that make them justified in a different application area.

The cloud-based solution is a more convenient choice, since since with a few extra hours can get an office available from anywhere without a separate device. The most effective use of cloud based solutions can be an office environment. It is important to note that the cloud requires a stable Internet connection and the initial synchronization with the cloud takes some time. This is not a problem in an office, since it only needs to be done once, and the sync (because of the fast and stable connections) only takes a couple of minutes. Thus, technically, the user's office and home computer becomes one. They run the same applications, the same files will be found on both, and their synchronization is almost unnoticed.

The main benefits also come from this synchron. On one hand, since synchronization is done through the network, there is no need for intermediate hardware, so there is virtually nothing that the user can lose. On the other hand, storage of data in the cloud virtually eliminates the possibility of data loss due to hardware failure.

However, the main disadvantage of the platform is beacuse of this technology. Using the cloud, we give away the complete control over our data, and a third party can get to know their content. For this reason, this solution becomes unsuitable for military use.

Another solution is to use a removable media. They offer much more mobility, and really do what the platform is about: making any computer work just like our own.

Its high mobility is due to the fact that the synchronization needed for the cloud is practically done by connecting the pendrive. However, a media with this mobility can still be considerably secure. This primarily comes from the fact that our data is not exposed for a single moment and is not transmitted over an open network. An additional security solution is done by the platform itself. It takes control of the storage, and regularly checks for unwanted modification. For more security, we can take further steps with the encryption application already discussed, VeraCrypt portable

Pendrive is useful for users who often move locally or between computers, but still need the security of their data. This solution speeds up the initialization process. The user sits down at a new computer, connects the usb key and runs the .exe file, and then he can use the apps instantly. there is no need to install your cloud service client or long synchronization. Thinking further, we will get to a new, fundamental aspect of mobility..

Blocking installations on a Windows operating systems is a very quick action, and it is often used by system administrators to prohibit unauthorized software installation. In addition, it is almost certain that we do not get administrative rights, so we can not run certain types of software. However, portable applications need no installation and are typically run without modifying the computer, so they do not require special privileges. Again, you can save a lot of dead time. You do not have to wait for the system administrator to purchase and install the necessary program, as it is already a part of our mobile office.

Financial Approach

So far, we have seen in many areas that portable applications served by the PortableApps platform have the potential to replace their professional counterparts. They all support the core functions and are able to meet the needs of daily work, and they can be used in the current environment. However, we can assume two main areas, due to which software companies stayed in business.

Well-built marketing has provided a major benefit, for example, to Microsoft products[5]. Among other reasons, their products stayed at the top, because companies got used to the well-tried software they always used, Microsoft did not make huge blunders, and based on the good feedback, other market operators also chose their software.

The other area that faces shortcomings is the lack of extensive infrastructure. Large software companies have departments to provide support at any given time to their customers.They have enough resources to better their applications to the entire perfection (based on their view). In contrast, free software development teams work with smaller numbers, meaning they do not have the opportunity to excel in every area. For example, most GNU software only have user forums to provide support, but immediate help is usually not available.

On parameters like these the given company's business policy should make decisions. However, it is worth examining the financial implications of the two approaches, the paid and the free software.

As examples, two of the six core office functions discussed in Chapter 1 were examined (e-mail clients, office suites). Anti-virus programs should be chosen based on security considerations, so I do not discuss them in this article.

The e-mail client is considered free in both methods. Thunderbird provided by PortableApps is a good alternative to MS Outlook, which is, however, included with most business-purpose Office packages. Bought as standalone software, Outlook costs approximately 15,000 HUF (roughly $55) per year per user.

There are higher differences between office software packages. PortableApps applications include OpenOffice and LibreOffice packages, of course, free of charge. An example of a professional office suite is MS Office, with different versions available at varying prices. The most basic small business package would cost approximately 30000 HUF (approximately $110) per user annually.

Similar analogy applies to almost every single function. Consider the applications used day by day. In many cases free software could easily substitute the professional ones. Using PortableApps means basically no cost, and even with complete protection -the Carbide- our expenses would not exceed 25000 HUF. It's worth considering whether we really require the rich functionality of paid software, or it would be better to create a free, lightweight, mobile environment that can be used at any time and almost any computer.

Portable applications in military environment

The basis for the operation of an organization is the effectiveness of the work of its employees. In peacetime, office workers in military organizations face with numerous administrative tasks during their duties. PortableApps provides access to open source alternatives of paid and expensive software. We can use it as a webbrowser (Chrome, Mozilla), document manager (OpenOffice, Libre Office), e-mail client (Thunderbird), and also it provides software, that can make our PC more secure (VeraCrypt Portable, Password Gorilla Portable). Using the PortableApps platform, we can prevent cases, where for instance a certain user tries to download a freeware from an unreliable source and thus his/her appliance becomes infected. The PortableApps platform is also compatible with other operating systems. We can utilize low-resource software, which is mostly used in office environment with a help of an utility called Wine on Linux interface. Its main positive aspect lies in its free usage. In a military organizations, the preparation of paperwork is largely accomplished electronically. In order to do this, there is no need for expensive office software packages, since we can produce the same quality work with PortableApps office software.

The effectiveness of work in the operational areas lies in the good use of time and the combination of mobility. The most convenient and easy-to-carry programs that are available at any time are the most suitable choice for eliminating the dead time triggered by hesitation. A new dimension could be the conversion of software used by soldiers in operational areas to portable apps, in order to ensure the effectiveness and performance of the work. For some reason (whether it is an unexpected blow or a technical error), we can transplant our work almost instantly to another computer with a help of a data carrier which enables us to use the certain software without installation. This is not part of the portable apps platform, it's just a new dimension that combines DIY apps and the military usage of them.

Conclusion

In this article, we have pointed out that portable applications in many cases prove to be more useful than their conventional counterparts. For users, who travel a lot, or change their computers frequently, it would be significantly better to have a "mobile office" created from portable applications.

The other goal of the study was to demonstrate the benefits of the PortableApps.com platform that make it particularly suitable for the implementation of the previously mentioned "mobile office". We've demonstrated how a Carbide pendrive with PortableApps can help users who want their "office" and the data created to be safe even with great mobility.

However, we must state that in certain situations we can not rely solely on free and portable programs. There are features and activities that can only be done using traditionally licensed software. We may not deny the use of such software.

On the level of an individual user, the “portable office” provided by the PortableApps platform deserves much greater attention than it currently has. Also, organizations should think over their potential and opportunities and, if justified, they should consider the use of portable applications as a custom application or within the platform.

The same idea can be applied to the army as well. According to the NATO SmartDefence's idea[6] about harmonizing requirements, it would be advisable to analyze the requirements of individual roles, as well as the positions of public employees, to provide them software based on their actual needs.

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