Newsletter - Calibrated for Creative Communications

Vol. 12, no. 1, Spring 2014

Into the Circuit

The Spring Newsletter is our opening to the 2014 circuit of ICT activities and publications.

It focuses on two major areas - Digital Innovation and History of Computing.

The first part is on Innovation and e-Skills with contributions from Peter Hagedoorn, Secretary General of the European CIO Organization, on the new role of the CIO, and Marc Bogdanowicz, Senior Scientist at IPTS-Seville, on a recent study on US policies for stimulating innovation and entrepreneurship.

This part is augmented by communications and links to the results of the most recent research on "e-Skills in Europe", and the European e-Competence Framework (e-CF).

The second focuses on History of Computing, with articles about the first constructed computers in Bulgaria, Czechoslovakia, Hungary, Italy, Lithuania, Poland, Romania and Serbia.

This special collection of information on Vitosha, SAPO, M-3, ELEA, EV80M, XYZ, MECIPT 1 and CER-10 is an entrée to the forthcoming 8th IT STAR WS on History of Computing on 19 September 2014 in Szeged, Hungary.

Join us for the Journey,

The Editor

IT STAR representatives

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Letters to the Editor

[Extracts from mails received in February]

Dear Plamen Nedkov,

The results from the most recent research on "e-Skills in Europe", funded by the European Commission (DG Enterprise and Industry), indicate a potential for more than half a million unfilled new jobs for ICT practitioners by 2015 in Europe. Already at the European e-Skills Conference on 10 December 2013 (www.eskills2013.eu), which gathered over 300 experts on the topic and where the preliminary results of this research were discussed. The conclusion drawn was that Europe is on the right track but still a lot needs to be done especially at national Member State level to ensure that the knowledge, skills and competences of the European workforce meet the highest world standards and are constantly updated in a process of effective lifelong learning.

Interested parties can now download the reports including 27 Country Reports at the following websites:

- *http://ec.europa.eu/enterprise/sectors/ict/documents/e-skills/index_en.htm (coming soon)*
- *http://eskills-monitor2013.eu/results/*
- *http://eskills2013.eu/conference/documents/*

We take the opportunity to remind you of the important conference "e-Skills International" which will take place on 26th March 2014 in Brussels. Online registration is open at: www.eskills2014.eu.

Best regards

André Richier
EC, DG ENTR

Werner B. Korte
empirica

I am delighted to communicate that the European e-Competence Framework (e-CF) version 3.0 is published and available on-line: www.ecompetences.eu.
The on-line features include:

- *Get the e-CF: free download and printed booklet order of e-CF 3.0 & user guide (English language)*
- *Test it: Customize your profiles with the e-CF Profiling tool*
- *e-CF use in practise: 15 case studies and multiple examples of current e-CF users*

Jutta Breyer, e-CF development leader ■

EDITORIAL POLICY

This Newsletter maintains a world-class standard in providing researched material on ICT and Information Society activities from the perspective of Central, Eastern and Southern Europe (CESE) within a global context. It facilitates the information and communication flow within the region and internationally by supporting a recognized platform and networking media and thus enhancing the visibility and activities of the IT STAR Association.

The stakeholders whose interests this newspaper is addressing are

- IT STAR member societies and members
- ICT professionals, practitioners and institutions across the broad range of activities related to ICTs in government, business, academia and the public sector in general
- International organizations

Special arrangements for the production and circulation of the Newsletter could be negotiated.

The newsletter is circulated to leading CESE ICT societies and professionals, as well as to other societies and IT professionals internationally. Everyone interested in CESE developments and working in the ICT field is welcome to contribute with original material. Proposals for articles and material for the Newsletter should be sent two months before the publication date to info@starbus.org.

The New Role of the CIO in Digital Europe

Peter Hagedoorn

Peter is Secretary General of the European CIO Organization since 2011.

Previously, he worked for Shell International, the Ministry of Economic Affairs in The Hague, Bull Netherlands, RAET, the Dutch Millennium Platform and Hagemeyer. He was later Chief Information Officer and Senior Vice-President of Océ NV.

The term CIO exists already for many years, but only since recently the CIO is really becoming a Chief Information Officer with Information becoming the key part in his functioning. Up till ca. ten years ago the CIO was mainly a technician, running the Data Centers of the organization, responsible for infrastructures and for a number of applications. He (or she) wasn't seen as an important member of top management. An IT department was a cost center, should run at lowest cost and more and more IT tasks were outsourced. The IT department and the business had in many cases a somewhat troubled relationship of not well understanding each other. Many columnists wrote articles about the IT department being phased out. The business should take over some IT activities and the remaining tasks should be outsourced. For sure, a person wanting to make a career should not become a CIO. Jokes were made about the term CIO meaning: "Career Is Over".

How rapid things can change! Today, every mature organization has a CIO, who is, in many situations, coming from the business or, anyway, a person with lot's of business knowledge and experience. Thanks to the vast developments in IT almost all businesses, but also governments, see IT as a major factor to renew their organization and services. Also thanks to new IT tools like Google, Social Media, smart-phones, games, apps, etc., a broad public uses the latest technologies, leading to a situation that IT at home is in many times more advanced than in organizations. And this mechanism in its term has lead to rapid renewal of office systems or implementation of the new tools in organizations. Big Data, Cloud Computing and Cyber security are also prominent on many Board agenda's today. Retail, banking, travel industry, logistics, governments, publishers, all these sectors are under enormous pressure to change their business models with IT or run the risk of market loss to newcomers.

This all has lead to a drastic changing role of the CIO today. While being in the past a back-office technician, today the good ones are the change agents of the business, the digital transformers or the **Chief Information & Innovation Officers**. The CIO department is supposed to understand the new technologies and to work together with the business in renewal projects. It is all about managing information in the most challenging and advanced ways and more technical questions loose importance thanks to more intelligent systems, while hardware and infrastructures are more and more outsourced or replaced by cloud structures. From a technical oriented department the modern CIO department is transformed into an innovation center in the core and forefront of the business - a true challenge for many CIOs and their people. Therefore, in many situations Boards are choosing new people in that position with another background and another profile. Soft skills and competences like communication, working in multi-disciplinary teams, creativeness and the ambition to show e-leadership in the required changes, are becoming more and more the key to survive as a CIO or as a staff member.

This new role and positioning has also lead to more public activities of the CIO. In Europe, the CIO community was up till ca. 5 to 10 years ago not really organized and didn't play a role in discussions about IT at European level. Large IT suppliers dominated the scene. But during the last years we see that in many European countries CIO communities are starting up and get organized. Ten years ago there was only one nationally organized CIO community (CIGREF in France). Today we see that in more than ten European countries national CIO communities are active and organized. They not only have their internal activities. CIO organizations today are involved in many national IT debates about cyber-security, cloud computing, Digital Agendas, new IT legislation, IT awareness campaigns and IT education.

Also at the European level, since three years the CIO community reformed from a loosely coupled round table organization into the European CIO Association, with a Board taking responsibility on IT developments on behalf of the ca. 600 larger organizations being members via national organizations or directly at European level. The association represents an IT budget of ca. € 150 billion and altogether these companies employ ca. 500.000 IT workers. This is also not unnoticed at European level with the European Commission and the IT-suppliers. The Association has a number of formalized Councils in which a permanent dialogue is established between the European Commission and the Association. Major topics discussed today are cloud computing, cyber security, innovation, e-skills and education. Besides the more formalized links, the Association is partnering in many EC projects, including dialogues about the new Digital Agenda. The CIO as representative of the IT-user community is "discovered" by the European Commission and by the European Parliament as an important factor to count with and listen to. It is well understood that a better economics climate in Europe is highly dependant on the renewal with IT of private and public organizations, thus the user communities of IT. This all implies that today we see that in many projects, meetings, committees the European Commission works together with both the IT suppliers and the IT user community. Besides these EC oriented activities, the Association also has direct meetings with IT suppliers at European level on many topics like licensing policies, price mechanisms, cloud computing, etc.

Today, we see that still in many European countries the CIOs have not developed mature organizations. We believe it is to the benefit of CIOs themselves, as well as for the societies they act in, when they get organized. The CIO community should take responsibility for the proper development of IT and the IT profession. CIOs should be involved actively in policy-making and actions to attract young people for the IT profession. Countries or organizations lagging behind in the advanced use of IT will loose position and quality to other countries and organizations that position themselves better. The CIO community has an important role to play in the renewal and enforcement of Europe's economy with IT as e-leaders „avant le lettre". ■

SBIR or How the US Runs the Innovation Race

Marc Bogdanowicz

Marc is Senior Scientist at IPTS - Seville

A rather fascinating forthcoming report, authored by Professor David B. Audretsch and Taylor Aldridge in collaboration with several researchers at IPTS, will present the main findings of a study on "The Development of US Policies directed at stimulating Innovation and Entrepreneurship" conducted by Audretsch Economic Research. This study was commissioned by the Institute of Prospective Technological Studies (IPTS) of the European Commission's Joint Research Center, as part of its line of research on *Rethinking Innovation and Industrial policies in the EU&US: ICT and high-tech industries and the EU-US productivity, innovation and R&D gaps*.

The report explores how US federal institutions fund and influence innovation in the knowledge economy context and if particular innovation policies could be replicated in other countries. Three key US agencies are identified as having significantly contributed to innovation and growth: (1) the Small Business Innovative Research Program (SBIR), (2) the Advanced Technology Program (ATP) and (3) the Defense Advanced Research Program Agency (DARPA). How these agencies have advanced US innovation is presented and discussed in the report.

First, the report describes US innovation policies and instruments and discusses the rationale for policies directed at stimulating innovation and entrepreneurship. The report demonstrates the important role of US public policies, including public-private partnerships and non-profit organizations, in enhancing entrepreneurship. These public policies reduce or at least compensate for market failures in the process of commercialization of ideas and conversion of inventions into commercial innovations. The authors argue that by encouraging university scientists and other knowledge workers to commercialize their products through starting new firms and facilitating this process, innovation policy can effectively generate spillovers and the commercialization of knowledge.

Indeed, there are indications that public policy can influence the cognitive process by which university scientists and other knowledge workers reach the decision to commercialize their research and enter into entrepreneurship. This would suggest that public policies such at the ATP and the SBIR can and do influence the career trajectories of university scientists.

The main example of innovation policy in the United States discussed in the report is the SBIR. The reason for this focus is because Horizon 2020, the new European program for research and innovation that will start in 2014 and run for seven years, includes a new SME instrument, building on the SBIR model. The SBIR was created to provide early stage funding and enable firms to cross what has become known as the "Valley of Death", or the financing constraints typically confronting new and young firms, especially in knowledge-based and high-technology industries.

The impact of the SBIR program in the US (Extract, pp.20-21)

The impact of the SBIR program has been analyzed in considerable detail in a series of meticulous studies undertaken by the Board on Science, Technology and Economic Policy of the National Research Council of the National Academy of Sciences, and also in a number of important studies by university scholars. There is compelling empirical evidence that the SBIR has generated a number of substantial benefits to the US economy. The country is no doubt more innovative and more competitive in the global economy and has generated more and better jobs as a result of the SBIR. (…) The key economic benefits accruing from implementation of the SBIR are most compelling in terms of two of the objectives stated in the Congressional mandate – the promotion of technological innovation and increased commercialization from investments in research and development.
There is strong and compelling evidence that the United States is considerably more innovative as a result of the SBIR program than it would be without it.

- **Recipient SBIR firms are more innovative:** Existing small businesses are more innovative as a result of the SBIR program. A painstaking study undertaken by the National Research Council of the National Academy of Sciences found that around two-thirds of the projects would not have been undertaken had they not received SBIR funding. The same study also identified a remarkably high rate of innovative activity emanating from the SBIR-funded projects. Slightly less than half of the SBIR-funded projects actually resulted in an innovation in the form of a new product or service that was introduced into the market. Such a high rate of innovative success is striking given the inherently early stage and high-risk nature of the funded projects.

- **The SBIR has generated more technology-based startups:** The SBIR program results in a greater number of technology-based firms. One key study found that over one-fifth of all recipient SBIR companies would not have existed in the absence of an SBIR award.

- **Recipient SBIR firms have stronger growth performance:** Studies consistently find that firms receiving SBIR grants exhibit higher growth rates than do control groups of matched pair companies.

- **Recipient SBIR firms are more likely to survive:** The early phase for technology entrepreneurial ventures has been characterized as *the valley of death*. The empirical evidence suggests that the likelihood of survival for young technology-based SBIR recipients is greater than for comparable companies in carefully selected control groups.

- **The SBIR has resulted in greater commercialization of university-based research:** Empirical evidence points to a high involvement of universities in SBIR funded projects. One or more founders have been employed at a university in two-thirds of the SBIR recipient firms. More than one-quarter of the SBIR-funded projects involved contractors from university faculties.

- **The SBIR has increased the number of university entrepreneurs:** Studies find that scientists and engineers from universities have become entrepreneurs and started new companies, who otherwise might never have done so. Some of these university-based entrepreneurs are involved in firms that have received SBIR grants. Others have been inspired to become entrepreneurs as a result of learning about the efficacy of becoming an entrepreneur from the observed success and experiences of their colleagues who have been involved with SBIR-funded companies.

In Phase I of the SBIR, SMEs receive funding to explore the feasibility and commercial potential of a new idea (proof of concept). In Phase II, R&D is supported with a particular focus on demonstration activities (testing, prototype, scale-up studies, design, piloting innovative processes, products and services, performance verification etc.) and market replication. Phase III of the SBIR is about commercialization though it does not provide direct funding. The agencies, which contribute to SBIR funding do not usually offer funding for Phase III awards. The exceptions are NASA and the Department of Defense, which may selectively offer small Phase III awards. The primary purpose of Phase III is simply to serve as a signal that the SBIR awardee has successfully completed Phases I and II and is therefore potentially ready for private sector funding.

The report examines the implementation of SBIR policies and also their possible adoption in other countries. It discusses the often-misunderstood role of government procurement under SBIR. The US federal procurement rules are very rigid and cost intensive; they impose on new firms high compliance costs, which give incumbent firms an advantage when bidding for federal contracts.

While completed Phase II projects have successfully demonstrated the feasibility of their innovative product (with a total potential SBIR Phase I and II funding of up to $1,150,000 per project), it can be difficult to acquire Phase III funding from private venture capitalists due to the fact that the product is not large enough to attract sufficient venture capital. The problem of crossing the Valley of Death remains for some firms, even after a successful Phase II. SBIR firms tend to be dependent on governmental SBIR funding and therefore lack the private venture capital network needed to attract large investments for large-scale production. Due to the lack of private venture capital interactions, private markets have a more difficult time appropriating the potential value of the product. Moreover, private venture capital markets are more likely to avoid funding innovative firms, which are heavily funded by SBIR due to the relatively higher regulatory burden and contract costs.

Just as venture capital markets are averse to governmental procurement (regulation) transaction costs in the US, one could expect them to be equally averse to procurement costs in other countries. A second problematic aspect for potential Phase III firms in other countries is venture capital regional specialization. Just as most venture capital for IT and Biotech can be found in Silicon Valley or Route 128 in the US, this same sort of specialization is also found in other countries. These regional differences may make it more difficult for Phase III firms to find the necessary funding for product production.

To conclude, the report identifies US policies, which could conceivably be replicated in other countries. Most notably, the authors argue that spurring innovation from European universities, with the help of a SBIR-like institution, may offer considerable help in transforming European ideas into innovations. The report concludes that the SBIR offered significant aid to innovative firms in the US and its replication by Horizon 2020 could also offer significant advantages for commercialization of inventions and ideas. However, the report points out several potential problems in adopting a SBIR-like program in other countries, mainly related to Phase III and to procurement.

The full report (58 pages) should be available shortly at: http://ipts.jrc.ec.europa.eu/publications/index.cfm under the title: “The Development of US Policies directed at stimulating Innovation and Entrepreneurship”. ■

First Computers in Central, Eastern and Southern Europe

The following articles on pioneering work in constructing the first computers in Bulgaria, Czechoslovakia, Hungary, Italy, Lithuania, Poland, Romania and Serbia were published in past issues of this Newsletter. In preparing for the forthcoming 8th IT STAR WS on History of Computing – www.starbus.org/ws8 we thought it would be valuable for the readers to have them as an integrated collection.

The Editor

Vitosha, the 1st Bulgarian Computer [1]

Kiril Boyanov

Kiril is Academician (Full Member) of the Bulgarian Academy of Sciences and Bulgarian representative to IT STAR. He has provided leadership within the Bulgarian ICT industry and in ICT R&D, notably as Director of the Institute of Parallel Processing at BAS.

The design of the first Bulgarian computer "Vitosha" started at the end of 1961 and its implementation was achieved in the beginning of 1962.

The team that developed the machine included Ass. Prof. Bl. Sendov, Eng. G. Alipiev, D. Bogdanov, Eng. D. Rachev, Eng. Encho Kyrmakov, Eng. Ilich Yulzari (person in charge), Eng. Ivan Stanchev, Eng. Kiril Boyanov, Eng. Maria Dimitrova, Eng. Raffi Aslanyan and Eng. St. Pashev. The scientific supervisor was Acad. Lubomir Iliev.

The digital electronic machine used a binary system, with fixed word length, in parallel mode. The word of the machine was 40 bits long. It used three-address instruction format. The main units of the machine were input device, output device, central arithmetic unit, memory and a control device. The control device can be regarded as two units – main control and auxiliary control unit. The memory (RAM) was on magnetic drum with a capacity of 4096 words. The machine was powered by a three-phase power 220/380 V. The cooling of the machine was ensured by a special fan system.

[1] Originally published in Vol. 4, no. 2, 2006

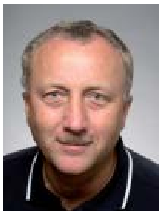
The machine was designed in a single unit, hosting all electronic circuits and the magnetic drum. The main elements were built with valves of the type ESS 862. They had a lifetime of about 10000 hours. The operator could control the machine from the control device and interfere, if necessary, in the computational process, to power up and stop the machine, to switch on and off the power supply. On the control device the state of the arithmetic unit and the counter of the command register could be observed. Here are also the switches for manual information input, resetting the registers and checking of basic operations – transfer the content of one register into another.

The input device worked with a five-channel tape punch, read by electro-mechanical device of standard telegraph type.

The output device followed a simple algorithm, as the output print is programmed. An electrical typewriter printed the results. All commands for the control of the typewriter were programmed – space, carriage return, new line, etc. The programs were written in machine code. ■

Antonin Svoboda and the 1st Czechoslovak Computer [2]

Julius Stuller



Julius is Deputy Director of the Institute of Computer Science, Czech Academy Sciences and Vice-President of the Czech Society for Cybernetics and Informatics.

The first Czechoslovak computer **"SAPO"** (in Czech ***SA****močinný* ***PO****čítač* is an acronym for Automatic Computer) was designed and constructed during the period 1950-1956 by a team led by ***Antonín Svoboda*** (1907-1980).

SAPO was most probably the first computer in the world designed as "fault-tolerant". Svoboda was the main architect of at least 20 original computer systems. During 1943-1946, just before his return to Czechoslovakia in 1946, he was a member of *the Radiation laboratory of MIT*. There he developed a methodology for the design of computing mechanisms and applied it in the design of the analog computer, which became part of the air defense system MARK 56. For his contribution to this defense system he got a very prestigious US *Naval Ordnance Development Award*. Svoboda wrote the very first book in the world on computers "Computing mechanisms and linkages" in 1946. ■

[2] Originally published in Vol. 4, no. 2, 2006

The Short History of M-3, the 1st Hungarian Electronic Digital Tube Computer [3]

Győző Kovács † 2012

Győző was Honorary President of the Foundation for the Hungarian Informatics History Museum and Perpetual Honorary President of the Hungarian Association of Tele-cottages. He served as Secretary General and Vice-President of the John von Neumann Computer Society.

The M-3 computer was constructed by members of the Cybernetics Research Group of the Hungarian Academy of Sciences (Magyar Tudományos Akadémia Kibernetikai Kutató Csoportja, abbr. MTA KKCs) from 1957 until 1959. The Group was established for the sole purpose of constructing the first Hungarian electronic tube computer, the M-3. The M-3 was and still is the symbol for the beginning of the age of computers in Hungary.

The M-3 Story

The Cybernetics Research Group of the Hungarian Academy of Sciences (MTA KKCs) was initially launched in 1955 as a department of the Measurement Industry Research Institute (Műszeripari Kutató Intézet), headed by Dr. Rezső Tarján. He was imprisoned politically and became free during this time, together with his two colleagues: József Hatvany and Dr. László Edelényi. They started to construct an electronic – EDVAC like – serial computer, the B-1.

In 1956 this department became an independent research group of the Hungarian Academy of Sciences under the direction of Mr Sándor Varga. Dr Rezső Tarján was appointed as the Scientific Deputy Director of the Research Group.

The main task of this Research Group was the construction of the first Hungarian electronic computer. The group, the youngest members of which had just finished the University of Sciences and Technology – I belonged to this category too – followed the construction of B-1, but our activities were not really successful.

Since Mr Sándor Varga wanted to construct a computer as soon as possible, he acquired the logic and the constructional designs of a newly developed Soviet (Russian) medium size computer, named M-3. We received the original Soviet design in Budapest which had not yet been constructed, therefore the members of our group had to correct – step by step - about 10-30 % of the logic and constructional design of the electronics.

The result of this work was that our version of the M-3 featured a lot of new solutions, such as, a part of the arithmetic unit, some new instructions of the instruction set, the magnetic drum controller, the input/output devices etc. It is interesting that the M-3 design was also given to research groups in Estonia and of China. They constructed their own M-3 computers, but we did not have any scientific connections, therefore these four M-3 computers – the Soviet, the Estonian, the Chinese and the Hungarian – were not compatible with each other. We could not exchange any software between us, but – during this time – we believed it was not necessary.. We did not recognize the importance of the compatibility and the exchange of software.

In the first version of M-3 we used Russian tubes and kuprox diodes, later - around 1960 - the Group decided to rebuild a part of the logic circuits – first the drum controller, then other parts of M-3, Hungarian long-life tubes made by the Tungsram factory were used.

The developing group was headed by Dr. Bálint Dömölki, a young mathematician, and I was appointed as his deputy. I was responsible to instruct the electronic engineering activities.

The acceptance test of M-3 was conducted and successfully concluded on January 21, 1959, in the presence of Mr. G. P. Lopato, chief constructor of the Soviet M-3.

After the successful acceptance tests, our mathematicians and economists solved several problems on the new computer, not only in the scientific domain, but also in technical and economic areas, as engineers, economists, mathematicians, linguists and many others started to study computer programming using the machine in their own fields of study. Already in the first few months of M-3 operations, calculations were carried out for some sections of the so important 5 year economic plans of the socialist planned economy, important operations research tasks, lingual statistics analyses, static calculations for a number of large building constructions, like the Elisabeth Bridge over the Danube, and many other tasks.

Our research group organized the first programming courses in Hungary, we published the first computer periodical, and its title was: “Tájékoztató” (Informatory). Our mathematicians proposed the organization of a new computer-programming faculty at the University of Sciences.

Our colleague Dr Béla Kreko proposed and started another new faculty at the University of Economics:“Planing and Economics”, where the students began to study economics, mathematics and computer science for the first time in the history of Hungarian universities (1960). I was invited to organize and teach this subject matter. I wrote the first university learning-book about computers. Dr Kreko and I also organized the first university- computer center – using an URAL 2 computer - at this university (1965).

When M-3 was successfully tested and accepted by the Hungarian Academy of Sciences (1959), Mr Varga ordered to set up within the framework of MTA KKCs the first Computer Center in Hungary. This Center had a Computer Operations Department, which was headed by me. We started

[3] Originally published in Vol. 6, no. 3, 2008

to work very soon in three shifts, the running of programs was interrupted every 8 hours, only for maintenance purposes. Because of the relatively short lifetime of the tubes, they needed to be changed every two-four weeks.

The members of the different research institutions and universities – coming to our Computer Center - solved a lot of mathematical, economic and technical tasks on our computer; it was the first opportunity for the scientific researchers to use an electronic computer in Hungary.

M-3 operated at the Hungarian Academy of Sciences'Computer Center till 1965. Then, the M-3 computer was transferred to the Cybernetics Laboratory of the József Attila University of Sciences, Szeged, which was headed by Academician László Kalmár, Professor of Mathematics and Logic in the University. This was the first Computer Center outside of Budapest. The head of the University's Computer Center was Dr Dániel Muszka.

In 1968 the M-3 became outdated, the computer was disassembled and the parts of the M-3 were then distributed among the various institutes of the university.

The greatest consequence of the development of M-3 was the very early introduction of a computer culture to the Hungarian scientific and research community. (See [1] – [9]). The M-3 was and still is the symbol for the beginning of the age of computers in Hungary.

Technical characteristics of M-3

Arithmetic unit
- 31 bits/word,
- parallel computing,
- four registers,
- operational speed:
  - o addition: 60 microsec,
  - o subtraction: 70-120 microsec,
  - o multiplication: 1,9 millisec,
  - o division: 2,0 millisec.

Input/output device
- Siemens T-100 teletype, tape reader and puncher, 5 position telex code,
  - o input/output speed: 7 chrs/sec.
  - o later: a Ferranti photoelectric tape-reader, 8 position code, speed: 300 chrs/sec
- Creed puncher, 8 position code, speed: 100 chrs/sec.

Memory
- First a magnetic drum, 1 kWord (later: 1,6 kWord) capacity,
- later two - simultaneously - running drums as back ground memory) were operating together (2x1600 Words),
- then: ferrit memory, its capacity was: 1 kWord.

Control Unit
- two address code,

31 bits instructions
  - o 1 sign bit,
  - o 6 bits for operational code,
  - o 12 bits first address,
  - o 12 bits second address

Power supply
- total power dissipation: about 10-15 kW

Parts used *(approximate numbers)*
- about 500 logic units,
- about 1000 vacuum tubes,
- about 5000 cuprox diodes,
- about 4000 resistors,
- about 3000 capacitors

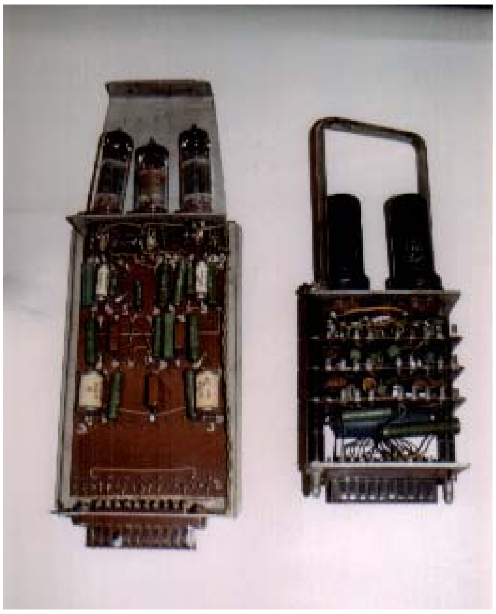
First Hungarian Computer-related Export

Two colleagues from the University of Timisoara (Romania), Viliam Loewenfeld and Joseph Kaufmann, were working on a tube computer (MECIPT 1) but were not able to acquire or purchase a memory device. I had some drum memories for our computer and our director, Istvan Aczel, permitted me to deliver free-of-charge to Timisoara a drum-memory as well as the technical design of the memory controller. They built the controller, we delivered the memory and the second Romanian computer - the MECIPT 1 - became operational soon. This friendly support was the first Hungarian computer-like 'export'.

Original photos of the M-3 computer

The engineering Group of the M-3: From left to right: Pohradszky S., – later: Röhrich, A. – Ábrahám I., Molnár I., Szanyi L., Kovács Gy., Várkonyi Zs., Dömölki B.

I. MOLNÁR and Gy. KOVACS with the M-3 drum memory.



The new (l) – constructed by me - and the old, originally (r) logic units of the M-3 computer

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MECIPT 1 – The 1st University Project and the 2nd Computing Machine of Romania [4]

NL article, based on input from V. Baltac

MECIPT 1 and Vasile Baltac (Photo 1962)

MECIPT 1 (The acronym stands for Electronic Computing Machine of the Polytechnics Institute of Timisoara) was completed in 1961 as a "first" university project and the second computing machine in Romania, after CIFA-1 of the Institute of Atomic Physics, Bucharest (1957). It was a first generation computer consisting of electronic tubes (~2000), discrete resistors and capacitors (tens of thousands). The speed was 50 operations per second (increased in 1962 by Vasile Baltac to 80-90 ops by a special memory allocation), the memory was a magnetic drum with 1028 words of 30 bits each. Programming was in machine code with input of instructions and data on punched paper tape. The output was in the form of an electric typewriter adapted with electromagnetic actuators. The structure was based on microprogramming inspired by articles from Maurice Wilkes, the British computer pioneer.

MECIPT 1 marked a first Eastern European cooperation, the memory drum being produced by an institute in Budapest, Hungary. As slow as it was, the computer was used for scientific and technical calculations, among them the calculations for the large dam on the river Arges and the dome of the Exhibition Hall in Bucharest.

MECIPT 1 was followed by MECIPT 2 (1964) - fully transistorized, ordered and used by a Construction Design Organization in Timisoara. MECIPT became a symbol of IT in Romania, and many people from MECIPT later contributed to the development of the Romanian computer industry. ■

[4] Originally published in Vol. 5, no. 4, 2007/08

ELEA, the 1st Italian Computer [5]

Giulio Occhini

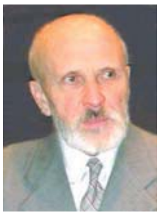
Giulio is AICA's Chief Executive Officer. He was President of CEPIS and has held leading positions in AICA including National President and Chairman of the Board. He served as IT STAR Coordinator for the period 2006-2010.

The first Italian computer was designed by Olivetti in the second half of the 50-ies and put on the market in 1959. ELEA was a large general-purpose system with very innovative features at that time. The overall system designer of ELEA was Giorgio Sacerdoti (*an obituary was published in the Autumn 2005 issue of this newsletter*). Worthy to be remembered: ELEA was fully transistorized, had multiprogramming capability and could connect a wide range of I/O devices.

About 180 ELEA systems were built in the period 1959-1965 and installed in large Italian companies, banks, government organizations and universities. A curiosity: the price of one of those systems was equivalent to several million EUR in today's currency … ■

The 1st Lithuanian Accounting Machine [6]

Gintautas Grigas



Assoc. Prof. Dr. Gintautas Grigas is an emeritus senior researcher at the Informatics Methodology Department, Institute of Mathematics and Informatics (IMI). He is a founder of the Extramural School of Young programmers in 1981, former head of the Programming Methodology Department of IMI, author of 30 books on Programming, Programming languages, teaching informatics (three books translated into Russian, one in Polish) and author of some 100 scientific papers and numerous science popularization articles.

In 1948 IBM launched the production of the highly successful accounting machine IBM 604. Ten years later a similar machine was designed in the Soviet Union and named EV80. The production of EV80 was carried out in the SAM factory in Moscow and at the Lithuanian factory VSMG (Vilnius Electronic Computer Factory). The machines of this class consisted of two devices: electronic processor and electro-mechanical punch-card input-output device.

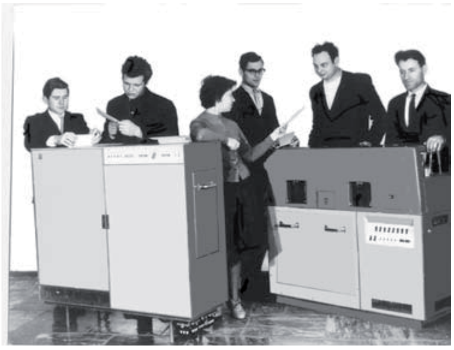
The feedback of EV80 users had shown that the work of the machine was not stable: there were problems with the short age of vacuum tubes. The first job of Vilnius SKB (Special Design Bureau), established in 1959, was to modernize EV80.

In 1959, a team consisting of Feliksas Atstopas, Stasys Girliavičius, Gintautas Grigas, Steponas Janušonis, Algis Petrauskas, Kęstutis Ramanauskas, Donaldas Zanevičius and Romualdas Žlabys under the leadership of Antanas Nemeikšis began with the modernization of EV80. It was decided to decrease the number of vacuum tubes, to change the construction of hardware cells and provide more reliable connectors. At that time, the quality of semiconductor diodes was sufficient enough for logic gates but the parameters of the transistors were not yet stable. Thus the diodes were used for AND and OR gates but vacuum tubes remained in inverters (NOT cells) and memory elements (flip-flops). The machine was named EV80M.

Already during the working phase of the project we gradually realized that the machine was below our expectations and it became obvious that hardware based on vacuum tubes had no future. Only a single experimental copy of EV80M was produced.

We were looking for other ways simultaneously and we came to the conclusion that it is possible to design an entirely new machine based on ferrite-transistor elements, not requiring extra stability of transistor parameters. While working on EV80M we worked as well on a new project. Alfonsas Lipnickas, Jonas Puodžius, Regina Valatkaitė, and others joined our team.

The new machine was named Rūta after the name of the Lithuanian national flower rue (lat. *ruta graveolens*). The parameters of the machine were close to those of EV80 (or IBM 604), but the construction and logical circuits were entirely different. The circulation of data was dynamic, decimal digits were coded by the code 8421+3, ensuring higher stability of performance.



Processor (left) and input-output punched card device

[5] Originally published in Vol. 4, no. 2, 2006

[6] Originally published in Vol. 6, no. 1, 2008

(right,) with members of the team

On December 23, 1962 after exhaustive testing the Joint Test Commission decided that Rūta was ready for production. Rūta was produced at the Vilnius Electronic Computer Factory until 1974 and 702 units were produced in total. The attractive features of the machine were simplicity of maintenance and low price, of course, relative to other machines of that time.

Rūta was exported to other Soviet republics and also to Bulgaria, Czechoslovakia, Germany, Poland and Romania.

The successful project was important by itself. In addition, this was the starting point for other Lithuanian computers: Rūta 110, M5000, M5100, SM1600, SM1700. ■

Poland's First Computers – How It Started [7]

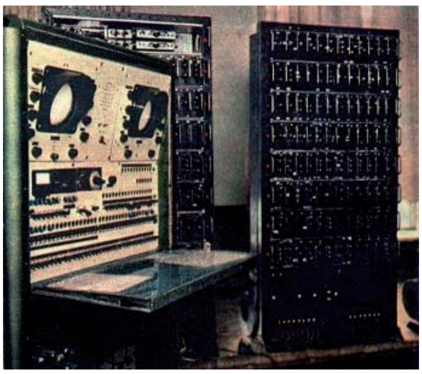
Stanisław Jaskólski

Mr. Stanisław Jaskólski, M.Sc. (E.Eng.), graduated at Warsaw University of Technology and since 1981 is a founding member of the Polish Information Processing Society. During 1966 - 1985 he worked for the Polish Central Statistical Office Data Processing Organization and from 1981 to1985 served as its General Manager. Later, he was consultant to Qualcomm Inc. (USA), and at present Stanislaw consults SELEX Communications S.p.A., a Finmeccanica company.

XYZ – The Polish Premiere

In 1950, the Polish Academy of Sciences established a special unit to study emerging issues of early computers. Originally named "GAM" (*Grupa Aparatów Matematycznych - Mathematical Apparatuses Group*) it evolved to IMM (*Instytut Maszyn Matematycznych –Mathematical Machines Institute*).

The decision to create the first computer in Poland was made at the end of 1955. This task was accomplished in three years – the machine named XYZ, fully designed and built in Poland, began operating in 1958.



XYZ computer front panel, behind – two racks with electronic circuitry

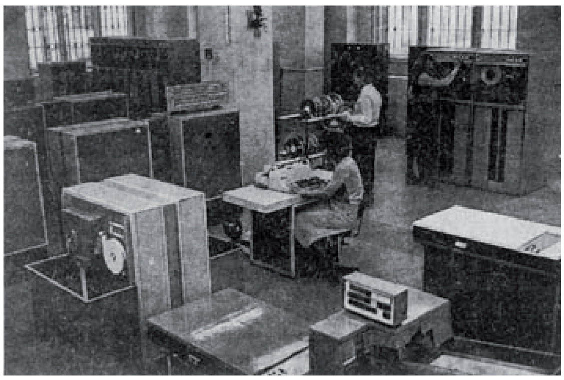
[7] Originally published in Vol. 6, no. 3, 2008

The XYZ computer was a serial, binary computer, built with approximately 400 tubes and 2000 diodes. Programming was in internal binary language and in a symbolic addressing system SAS; after 1960 also by SAKO – algorithmic language compiler (SAS and SAKO were original Polish software products, developed by IMM, highly appreciated by computing specialists at that time). Input/output equipment was based on standard Hollerith punched card reproducer. The speed of this computer reached up to 1000 arithmetic operations per second.

The XYZ, although an experimental model, was a fully usable digital computing machine. The experience gained by several customers was crucial for further development of the computers in the ZAM, since GAM was temporarily renamed to Zakład Aparatów Matematycznych *(Mathematical Apparatuses Division*). Here, the team of mathematicians and engineers designed and built the next series of digital computers named ZAM-2, ZAM-21 and ZAM-41. The total number of produced ZAM computers was about 30 units. ZAM 21/41 computers were equipped with line printers, magnetic tape and paper tape input/output units.

ZAM 21

The experience Polish scientists, programmers, engineers gained in these early years led to the further development of the computer industry in Poland. The ELWRO factory, located in city of Wrocław, played a leading role since 1970, where approx. 600 units of the ODRA family of computers were manufactured. The most important products of this family are ODRA 1204 (own design), and ODRA 1305/1325 (fully compatible with British ICL- 1900 computer series). The last ODRA 1305 computers were used successfully up to 2005.



ODRA 1305 ■

CER-10 – The First Digital Electronic Computer in Serbia [8]

Dusan Hristovic

Dusan is computer hardware engineer (retired) and consultant at M. Pupin Institute, Belgrade, Serbia. He is coauthor of six books and author of some 50 scientific papers, has served as Secretary General and President of the ETRAN Society of Serbia (1980-1992) and is a founding member of the Serbian Informatics Society (DIS). Mr. Hristovic was designer of the CER-10, CER-22, HRS- 100 and TIM computer line PC systems.

CER-10 is the first digital electronic computing machine, originally designed and produced in Serbia and the former Socialist Federative Republic of Yugoslavia, in the "Vinča" Institute, during the period 1956- 1960. Due to an addition of a functional extension of the so-called Statistical Unit, the final construction took place in the "Mihailo Pupin" Institute in Belgrade at the end of 1962. CER-10 began its operational life at the TANJUG building in Belgrade in 1963. CER-10 was used for scientific and technical research for solving various mathematical problems in the SKNE "Vinča" and for statistical cryptological processing of information for the Yugoslav Federal Government (SSUP and TANJUG Agency). In fact, by structure, CER-10 is the universal, electronic, one-address, dynamic computer. Its average speed of processing was about 50,000 simple operations per second (i.e. it means, about 1,600 additions per second).

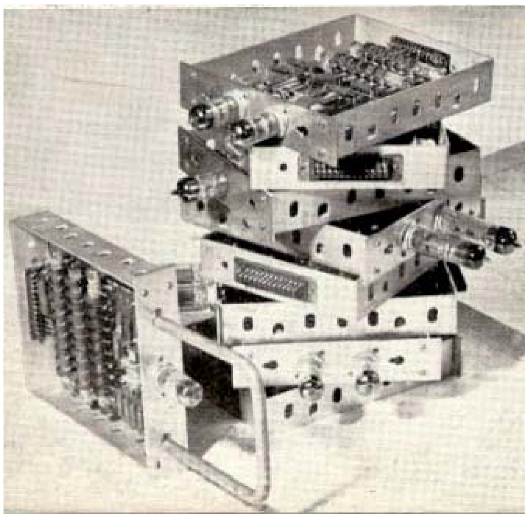
The author-team of designers and constructors of the CER-10, in the "Vinča" Institute, was: Academician Rajko Tomović PhD, Professor Tihomir Aleksić, Professor Ahmed Mandžić, Engineer Petar Vrbavac, Vukašin Masnikosa PhD, Engineer Dušan Hristović and Milojko Marić PhD. In the development of all system parts and the construction of CER-10 70 persons (engineers, programmers, technicians and specialist- workers) have taken part in the course of three years.

Only six states in Europe: England, Germany, Russia (USSR), France, Yugoslavia and Poland had their own original computing electronic digital machines developed over the period from 1949 to 1959.

Technology and Technical characteristics of the CER-10

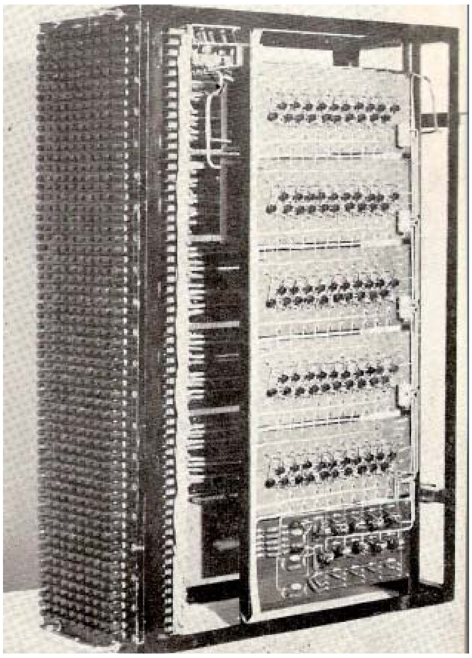
- Primary operational memory with a capacity of 2x12 Kbytes, 2 subsystems of matrix ferrite memory with memory cores type Philips 6D3 pfi 2mm and switching cores 6E2. Memory word is 30+1 bits, of changeable length word (max 6 characters: numbers, letters, symbols of 5 bits). Access time for the ferrite memory was 10 microseconds.
- Control Unit, named CPU (24 basic instructions in total) and Arithmetic Unit were composed from the standard logic circuitry modules made by electronic vacuum tubes, transistors, Ge-diodes and R,L,C discrete components.
- Input/Output Units: Photoelectric Reader of punched paper tapes Ferranti type TR 2B (speed 300 char/sec); Paper tape Puncher Creed type 25 (max. 100 char/sec); Tele printer - teletype Siemens model T-100 (printing speed of 8 -10 char/sec).
- Power Supply system: an independent motor generator with nominal power 20/15,5 KVA, produced by "Rade Končar" company, Zagreb. Rectifiers with three-phase circuitry had Si-diodes types 14R2 and 10R2 (Th. Houston). There was automatic regulation, relay protection and signalisations for all power units (i.e. for 12 positive and negative voltages in CER-10).
- The computer room in the TANJUG building had 80 m2, with double flooring and air conditioning. The metal rack dimensions were 2m x 2m x 0,70 meters for each of the seven rack units.
- Technology: Philips electronic tube types ECC 81, EL 83 etc. (approx. 1.750 pieces); Transistors: 2N396, OC 76, OC 44 (1.500 pieces); Ge-diodes OA 85 Philips, for logic circuitry, (approx. 14.000 pieces); Electronic relays type Schrack (approx. 650 pieces); Pulse transformer core D25 (approx. 1.700 pieces); Delay pulse Lines (approx. 850 pieces), etc.

CER-10, at the Tanjug-building, 1963



CPU Logic Circuitry Modules

[8] Originally published in Vol. 7, no. 1, 2009



Statistical Unit

Literature (Reference publications)

1) R.Tomovic, A.Mandzic, T.Aleksic, P.Vrbavac, V.Masnikosa, D.Hristovic, M.Maric: *"Digital Electronic Computer CER10 Inst. BK-Vinca"*, Proc. of V Conf. ETAN-1960, vol.1, pp. 305-330, Belgrade Novem.18th 1960;
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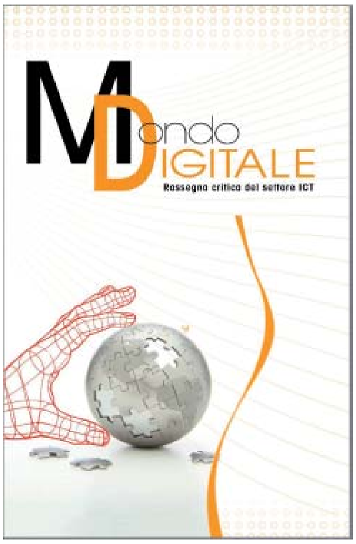
3) V.Paunovic, D.Hristovic: "*Preview and Analysis of CER Computers* ", Proc. of the 44.Conf. ETRAN-2000, tom 3, pp. 79-82, Sokobanja June 26th 2000. (in Serbian);
4) M.R. Williams: "A History of Computing Technology", Prentice-Hall, 1985.
5) http://en.wikipedia.org/wiki/CER_Computer; (CER-10, CER-22, CER-203, CER-12, HRS-100, TIM-100, etc.) ■

Partner Publication



http://mondodigitale.aicanet.net/ultimo/index.xml ■

Member Society News & Events

Italy
7 – 9 May 2014, Naples: 28th DIDAMATICA Conference of AICA - http://didamatica2014.unina.it/

Slovenia
14 – 16 April 1014, Portoroz.: Annual conference of Slovenian Society "INFORMATIKA" - www.dsi2014.si

Forthcoming IT STAR Event

8th IT STAR Workshop on History of Computing
19 – 20 September 2014, Szeged, Hungary
www.starbus.org/ws8 ■

EU ICT 2014 Calls for Proposals

EU ICT 2014 Calls are available at
http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-ict-2014-1.html

Deadline for submissions: 23 April 2014.

Topics include:

- ICT-01-2014: Smart Cyber-Physical Systems
- ICT-02-2014: Smart System Integration
- ICT-03-2014: Advanced Thin, Organic and Large Area Electronics (TOLAE) technologies
- ICT-05-2014: Smart Networks and novel Internet Architectures
- ICT-06-2014: Smart optical and wireless network technologies
- ICT-07-2014: Advanced Cloud Infrastructures and Services
- ICT-09-2014: Tools and Methods for Software Development
- ICT-11-2014: FIRE+ (Future Internet Research & Experimentation)
- ICT-13-2014: Web Entrepreneurship
- ICT-15-2014: Big data and Open Data Innovation and take-up
- ICT-17-2014: Cracking the language barrier
- ICT-18-2014: Support the growth of ICT innovative Creative Industries SMEs
- ICT-21-2014: Advanced digital gaming/gamification technologies
- ICT-22-2014: Multimodal and Natural computer interaction
- ICT-23-2014: Robotics
- ICT-26-2014: Photonics KET
- ICT-29-2014: Development of novel materials and systems for OLED lighting
- ICT-31-2014: Human-centric Digital Age
- ICT-32-2014: Cybersecurity, Trustworthy ICT
- ICT-33-2014: Trans-national co-operation among National Contact Points
- ICT-35-2014: Innovation and Entrepreneurship Support

8th IT STAR WS on History of Computing

19 September 2014, Szeged, Hungary

Content

- Announcement
- Related Publications
- Mission and Scope
- Program
- Papers and Publication

Announcement

8th IT STAR Workshop on History of Computing

We are pleased to announce that the 8th IT STAR workshop will be held on Friday, 19 September 2014 at the Museum of Computing in Szeged, Hungary.

Host

John v. Neumann Computer Society – www.njszt.hu

Mission and Scope

The 8th IT STAR Workshop on History of Computing will focus uniquely on computer and informatics related developments in Central, Eastern and Southern Europe – projects, processes, interactions and results – within a period of 4 decades beginning in the 50-ies of last century.

Attention would be given to national and regional programs and processes that led to the construction of the first computers and their applications. The social impact of this activity would be examined with emphasis on research, education and industry. The computer pioneers – constructors, policy makers and managers – will be in the spotlight with recollections of their achievement and their motivation as role models to current and future generations.

Computing History museums in the region (real and virtual), their approach in documenting and preserving IT History, and their role in helping understand the technological processes and the driving forces of innovation, will also be presented.

An important outcome would be the publication of the edited conference proceedings.

Organization

The one-day conference on 19 September will involve up to 10 speakers on topics as outlined in the Mission and Scope. The program will allow time for additional communications and a general debate. A guided tour of the permanent IT exhibition is foreseen.

The IT STAR Business meeting (invited representatives only) will convene during the morning of 20 September.

Papers & Publication

Extended abstracts and the PowerPoint presentations will be posted on the conference website. The edited post-conference proceedings will be published in the IT STAR series under IT STAR copyright.

Key Dates for submission of invited papers and presentations:
Deadline for extended abstracts of about 200 words – 5 May
Full papers and ppt presentations – 25 August

Contacts

Conference information will be regularly updated and posted at www.starbus.org/ws8.
Expressions of interest to participate should be sent to P. Nedkov <nedkov@utanet.at>.

Organization

- IT STAR
- Conference Co-Chairs

Venue

- Museum of Computer History

Host

- John von Neumann Computer Society

Member Societies

- IT STAR Member Societies

SNAPSHOT

REGIONAL ICT ASSOCIATION IN CENTRAL, EASTERN & SOUTHERN EUROPE

Type of organization

Regional non-governmental and non-profit professional association in the ICT field.

Date and place of establishment

18 April **2001**, Portoroz, Slovenia

Membership

Countries represented (*see next page for societies*), year of accession, representatives

- Austria (2001) V. Risak, G. Kotsis, E. Mühlvenzl
- Bulgaria (2003) K. Boyanov
- Croatia (2002) M. Frkovic
- Cyprus (2009) P. Masouras
- Czech Republic (2001) O. Stepankova, J. Stuller
- Greece (2003) S. Katsikas
- Hungary (2001) B. Domolki
- Italy (2001) G. Occhini
- Lithuania (2003) E. Telesius
- Macedonia (2003) P. Indovski
- Poland (2007) M. Holynski
- Romania (2003) V. Baltac
- Serbia (2003) G. Dukic
- Slovakia (2001) I. Privara, B. Rovan
- Slovenia (2001) N. Schlamberger

Statutes

IT STAR Charter http://www.starbus.org/download/charter.pdf adopted on 23 October 2004 by the IT STAR Business Meeting in Prague, the Czech Republic.

Mission

"To be the leading regional information and communication technology organization in Central, Eastern and Southern Europe which promotes, assists and increases the activities of its members and encourages and promotes regional and international cooperation for the benefit of its constituency, the region and the international ICT community."

Governance

IT STAR is governed according to the letter of its Charter by the Business Meeting of MS representatives:

2013 Bari, **Italy** (May)
2012 Bratislava, **Slovakia** (April)
2011 Portoroz, **Slovenia** (April)
2010 Zagreb, **Croatia** (November)
2009 Rome, **Italy** (November)
2008 Godollo, **Hungary** (November)
2007 Genzano di Roma, **Italy** (May)
Timisoara, **Romania** (October)
2006 Ljubljana, **Slovenia** (May)
Bratislava, **Slovakia** (November)
2005 Herceg Novi, **Serbia & Montenegro** (June)
Vienna, **Austria** (November)
2004 Chioggia, **Italy** (May)
Prague, **the Czech Republic** (October)
2003 Opatija, **Croatia** (June)
Budapest, **Hungary** (October)
2002 Portoroz, **Slovenia** (April)
Bratislava, **Slovakia** (November)
2001 Portoroz, **Slovenia** (April)
Como, **Italy** (September)

Coordinators

2010 –	Igor Privara
2006 – 2010	Giulio Occhini
2003 – 2006	Niko Schlamberger
2001 – 2003	Plamen Nedkov (cur. Chief Executive)

Major Activities

- 7th IT STAR WS on eBusiness - http://www.starbus.org/ws7
- 6th IT STAR WS on Digital Security - http://www.starbus.org/ws6
- IPTS - IT STAR Conference on R&D in EEMS - http://eems.starbus.org
- 5th IT STAR WS and publication on Electronic Business - http://starbus.org/ws5/ws5.htm
- 4th IT STAR WS and publication on Skills Education and Certification - http://starbus.org/ws4/ws4.htm
- 3rd IT STAR WS and publication on National Information Society Experiences – NISE 08 http://www.starbus.org/ws3/ws3.htm
- 2nd IT STAR WS and publication on Universities and the ICT Industry http://www.starbus.org/ws2/ws2.htm
- 1st IT STAR WS and publication on R&D in ICT http://www.starbus.org/ws1/ws1.htm
- Workshop and publication on National Experiences related to the EU's 5th and 6th FP http://www.starbus.org/download/supplement.pdf
- Joint IT STAR – FISTERA Workshop on ICT and the Eastern European Dimension

Periodicals & Web-site

The IT STAR Newsletter (nl.starbus.org) published quarterly.
www.itstar.eu ■

IT STAR Member Societies

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Croatian IT Association– CITA Ilica 191 E/II, 10000 ZAGREB, Croatia Tel. +385 1 2222 722 Fax +385 1 2222 723 e-mail: hiz@hiz.hr www.hiz.hr	**The Cyprus Computer Society – CCS** P.O.Box 27038 1641 NICOSIA, Cyprus Tel. +357 22460680 Fax +357 22767349 e-mail: info@ccs.org.cy www.ccs.org.cy
Czech Society for Cybernetics and Informatics – CSKI Pod vodarenskou vezi 2, CZ-182 07 PRAGUE 8 – Liben Czech Republic Tel. +420 266 053 901 Fax +420 286 585 789 e-mail: cski@utia.cas.cz www.cski.cz	**Greek Computer Society – GCS** Thessaloniki & Chandri 1, Moshato GR-18346 ATHENS, Greece Tel. +30 210 480 2886 Fax +30 210 480 2889 e-mail: epy@epy.gr www.epy.gr
John v. Neumann Computer Society – NJSZT P.O. Box 210, Bathori u. 16 H-1364 BUDAPEST, Hungary Tel.+36 1 472 2730 Fax +36 1 472 2739 e-mail: titkarsag@njszt.hu www.njszt.hu	**Associazione Italiana per l' Informatica ed il Calcolo Automatico – AICA** Piazzale R. Morandi, 2 I-20121 MILAN, Italy Tel. +39 02 760 14082 Fax +39 02 760 15717 e-mail: g.occhini@aicanet.it www.aicanet.it
Lithuanian Computer Society – LIKS Geležinio Vilko g. 12-113 LT-01112 VILNIUS, Lithuania Tel. +370 2 62 05 36 e-mail: liks@liks.lt www.liks.lt	**Macedonian Association for Information Technology – MASIT** Dimitrie Cupovski 13 1000 SKOPJE, Macedonia e-mail: indovski.p@gord.com.mk www.masit.org.mk
Polish Information Processing Society ul. Puławska 39/4 02-508 WARSZAWA, Poland Tel./Fax +48 22 838 47 05 e-mail: marek.holynski@gmail.com www.pti.org.pl	**Asociatia pentru Tehnologia Informatiei si Comunicatii – ATIC** Calea Floreasca Nr. 167, Sectorul 1 014459 BUCAREST, Romania Tel +402 1 233 1846 Fax +402 1 233 1877 e-mail: info@atic.org.ro www.atic.org.ro
JISA Union of ICT Societies Zmaj Jovina 4 11000 BELGRADE, Serbia Tel.+ 381 11 2620374, 2632996Fax + 381 11 2626576 e- mail: dukic@jisa.rs www.jisa.rs	**Slovak Society for Computer Science – SSCS** KI FMFI UK, Mlynská dolina SK-842 48 BRATISLAVA, Slovak Rep. Tel. +421 2 6542 6635 Fax +421 2 6542 7041 e-mail: SSCS@dcs.fmph.uniba.sk www.informatika.sk
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