

Effects of Higher Education Infrastructure Facilitating Links with International Research on the New National Public Service University

„Knowledge is, which is never amortised in use”

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Nowadays the use of the attribute 'globality' became a fashionable term, when speaking about economics, politics, security, informatics or any other significant process with great effect or the changes of nature and climate. Beyond the fashionable terms globality has a real content, as it becomes characteristic that not every command, operation and control processes of a developing or developed country can exist within the national framework, it is connected to the external world with thousand links, this external environment will become determining for it.

This is arising from the procurement needs of power resources, from the free movement of people, ideas and goods (multinational countries formulate due to migration), disappearance of differences in time and space, the fabric of stock exchange and economic relations, from the distributed production.

Making it simpler, globality is expressed in any significant economic, political, ideal changes, relating to law and order, the affects of larger disasters can increasingly be sensed in the rest of the world and parrying these effects is more difficult. Let's just consider the recent earth quake and tsunami in Japan, due to which several European countries decided to restrict the operation of nuclear power plants and switch to other power resources.

When we consider the scientific world, then globality is also present in this area. On the one hand, in the manifestations of scientific results, as recently each new discovery, new product becomes general almost without delay; while on the other hand, resources of one nation are inadequate to solve more complex scientific problems.

The question is arising from this latter thought, how can higher education institutes participate in scientific research demanding more national resources, and consequently what are the chances of the new National Public Service University (hereinafter referred to as NPSU). In reality there are several methods evolved to get higher education institutes involve into scientific research, like the Scientific Students' Associations, establishing special colleges, PhD schools, joint research and development, experiments, tender applications, clusters, operating academic research groups, achieving research university status.

To answer the question, one must start from the educational portfolio of NPSU, and what kind of research areas can be handled with this portfolio, what kind of theoretic, scientific

guidelines demanding international co-operations can be developed for solving problem situation.

If we consider the composition of the new university, its predecessor, the Zrínyi Miklós National Defence University, Police Academy and Administration Faculty of Corvinus University of Budapest, then we can see that these three institutes cover the theoretic theatre of security in its broader sense, which is clearly expressed by the point of view of the government.

„The Parliament, recognizing that strengthening the sense of vocation and proficiency among the personnel of the public service, including civil administration, law enforcement, national defence and national security necessitates synchronised and scheduled replacement education, furthermore, instead of leaving the profession, a further education system shall be operated to provide efficient work for the benefit of the society, to support public service career model, and the higher education of public service experts shall be place to uniform institutional grounds.”¹

Higher educational institutes to be integrated into the new university were determined in the above spirit.

„The legal successor institute will be established by merging
a) the Zrínyi Miklós National Defence University (hereinafter referred to as ZMNDU) and
b) Police Academy of Hungary (hereinafter referred to as PAH) transformation, as well as
c) Corvinus University of Budapest (hereinafter referred to as CUB) separated from Faculty of Administration (hereinafter referred to as Faculty) on 1st January, 2012.”² [1]

Reviewing the interpretation of public service and security, we must arrive to the conclusion that providers of public service are important players of creating and maintaining security. [2]

If we want categories, players of public service can be divided into three major groups.

Politicians, leaders of self governments and other national institutes establishing public service, ensuring operational rules and conditions belong to the first group.

The second category is comprised of persons, national authorities, other institutes (public service education) providing direct public service activities. These are the national defence forces, the police, secret services, administration, health service, education, disaster management, fire brigades, ambulance, finance guard, prison guard, public and civil servants of government and self-government organizations with relevant national authorities.

The elements of the third category are those, who provide direct public service activities, who facilitate public service activities in any form, who contributes to provide its conditions. Furthermore, the leaders of strategic industry, power centres, strategic research institutes and providers of critical infrastructures also belong here.

Studying security the followings can be concluded. [3], [4], [5], [6]

Security is such a state, in which threats and endangering situations are opened and adequate deterrent, defending, averting, eliminating measures are developed, which can exclude, hinder, relieve, restore the consequences of the damages occurred, as well as adequate plans, models, trained forces and tools are available for their implementation.

¹ HUNGARIAN GAZETTE No. 33. <http://kozlony.magyarorszag.hu/keresesdatum> Law No. XXXVI. of 2011 on Establishing Public Service University 28 March, 2011, Monday.

² HUNGARIAN GAZETTE No. 33. <http://kozlony.magyarorszag.hu/keresesdatum> Law No. XXXVI. of 2011 on Establishing Public Service University 28 March, 2011, Monday.

‘The fact that security is a complex term interpreted “in a wide band” is also proved that we can meet it recently, relating to several walks of life, connected to the following words and terms, among others:

- politics (with philosophic interpretation to a certain extent);
- military;
- social;
- community (with philosophic interpretation to a certain extent);
- environmental;
- nuclear;
- energetic;
- ecologic;
- transportation;
- information and communication;
- certainty of existence;
- safety of technical systems (nuclear power plants, power supply systems;
- informatics systems, etc.)

According to the scope of security, this can be:

- global (to the whole world);
- regional (one or more continent, or some parts of them), extending to countries of allied systems;
- countries, parts of countries;
- bigger or smaller communities;
- individuals.”³

Basic platform of maintaining security is the protection of critical infrastructures. [7], [8], [9]

Use of the traditional (open and covert) and new forms of information gathering, like the global electronic information gathering, it is inevitable to achieve the adequate level of security, especially in regard of critical infrastructures.⁴

Global electronic information gathering is manifested in that satellites can see the whole surface of the earth, Internet covers the whole world, if somebody is connected to the world wide web, then all of the virtual surfing can be traced, hackers can gather every information, and the his or her bank account can be virtually robbed. By monitoring mobile telephones the movements, physical whereabouts of the user can be recorded; just like the use of a bank cards similarly leaves traces behind. Video and infra cameras can be deployed anywhere, they can see and electronically record the happenings day and night. To monitor the activities of people countless motion detectors and sensors can be use. Rumours came to the light in connection with the influenza epidemic in 2010 that instead of immunization a microchip is planted to the people. It is possible technically, as similar methods are in use to register cats and dogs for a long time. These equipments, tools are all electronic, intelligent can continuously be operated without human control and can electronically, mainly digitally record the collected information. This digital information can be sent to any place on earth very rapidly, without any distortion.

Unlike the two traditional information gathering methods are mainly built on analogue methods (document readings, live speech, photograph, voice recording, telephone tapping etc.), and the collected information is stored on analogue information carriers, global

³ Dr. Hadnagy Imre József: Modern interpretation of security – or today is more uncertain than any time earlier, <http://www.vedelem.hu/letoltes/tanulmany/tan135.pdf> , 10 September, 2010. p. 5.

⁴ Dr. Zsigovits László: Possible Directions of R+D+I and Application Activities of the New National Public Service University, ZMNDU Hadmérnök (Military Engineer) 2011/2 edition

electronic information is generated in digital form. Rapid transmission, digitalized storage, efficient processing of information gathered by traditional means requires digitalization first, which is time and cost consuming.

Data carrier of global electronic information gathering is based on digital equipments and technologies, this way it can be immediately be processed and transmitted through electronic networks. The face of a person recorded by a video camera can be run on face recognition software and matches can be displayed, if this person could be found in the portrait archive of the control authority due to any reason.

If we study the complex interpretation of the above security, we have to deduct the conclusion that the mission, composition, future theoretic and scientific curriculum of the new National Public Service University will completely cover each elements of the complex security.

Providers of public services are connected to every area of the complex security in some form. They either directly creates, maintain it, or define the legislative and other operational frameworks for them, or in case of security breaches they implement investigative or procedural actions, they participate in elimination damages, in restoring the original situation.

Deriving from the above it can be easily seen that public service organizations are those, which means the foundation-stone of creating and maintaining security.

The conclusion can be drawn from this that the science of security began to take shape is such a global science, which serves the scientific foundation of the activities of public service providers, and in the meantime it answers the question raised – the opportunities of NPSU in the field of getting connected to international research activities – indeed, NPSU has wide competences in the field of international research activities can be the cradle of cultivating the science of security.

We will study the possible institutional frameworks of NPSU on the field of international scientific research work.

First of all the research concept shall be developed by the Science Organizing Centre, the research strategy shall be created alongside of which external relation can be established and shall be able to develop the research programmes. The ZMNDU has got established relations on the field of science organization, operates two PhD Schools, has got broad international relations arising from NATO, EU and Schengen membership of Hungary, operates the Strategic Defence Research Institute. Background institutes assisting the scientific research activities have significant role in the successful work, like informatics services, quality assurance, application office and career office. The ZMNDU has got well functioning organizational elements on these fields. The listed competences of ZMNDU can provide a good foundation for establishing the science organizing of the new university.

Faculties, Institutes, Departments can work out their own research goals, research tasks. They can primarily rely on the work of the Scientific Students' Association and talent management, students with research veins can be mobilized in these two fields. The department are those, which got the most opportunity to establish relations with external bodies (armed, law enforcement, industry, entrepreneurs, partner institutes), to develop joint research concepts. The career office via its career monitoring system can efficiently facilitate the development of the external relations, the involvement of the teachers, researchers, PhD students into the scientific research activities. Establishing various special colleges can happen on faculty level.

A higher level of talent management is the operation of the PhD Schools. Even graduating students can be inspired to this increased level of scientific work, while the career office can recruit from among the graduated students.

Establishing research networks can mean the broader, sometimes international extension of the research work. Research networks can be practically operated along such programmes,

which process regional or global security issues. These are multiplayer programmes having government and self-government bodies, industrial ventures participating in them. The activities in the research networks demand group work, generally they work with huge datasets, conclude significant quantity of computations, the basic requirement of which is the super-computer support via rapid data transfer networks.

Establishing research networks can be greatly facilitated by joining various clusters.⁵ [10] Establishing clusters on the basis of membership fee paying by the alliance of small and medium size ventures, facilitating R+D+I activities, technology and knowledge transfers to operate knowledge bases. Their goal is to facilitate the innovation processes of the partners and their marketing. Clusters are privileged at evaluation of certain applications. Workshops, partnership meetings, professional days, conferences, special exhibitions are organized to facilitate the co-operation; similarly they submit joint tender applications, continuously evaluating the results of co-operations.

The successful research networks and clusters enable to set up such global or general security problems, the solution of which academic research group can be established.

Achieving research university status can be the final goal in the evolvement of the mission of the new university. It has a real chance, as creating security, maintaining global status, safely operating critical infrastructures are inevitable preconditions of maintaining quality of life. Hungary's membership in NATO and EU can ensure opportunities to participate in solving global problems.

If we study the recent problems of national defence and law enforcement, then we can discover several markedly profiled research areas, in which all the military and law enforcement organizations are concerned.

One of these areas is environment protection, in which national defence and law enforcement, as well as the public administration, as a polluter of the environment, and environment protectionist also participate. The mentioned organizations use vehicles, consume vast quantities of power, and work with hazardous materials, which are polluting the environment. If we succeed with developing new technologies, processes and equipment of application, then environment pollution can significantly be reduced. However disclosing environment pollutions and to make the required actions for their elimination in many regard belongs to the responsibility of the above mentioned organizations. The efficiency of disclosing can be significantly improved by the research of new technologies, processes.

An other general area is information protection. National defence and law enforcement organizations, the administration belongs to that target group, which may be in the focal point of attacks both by hackers and terrorists or hostile intelligence. Disclosing culprits of attacks against other target objects (banks, power supply etc.) law enforcement bodies play a vital role. It is an existing threat, even if the electronic combat, cyber attack or robot warfare is still in latent state.

Illegal migration, arms, drug, fissile material and human trafficking is also significant threat resource. The category of threat resource affects almost the whole society, where in disclosure and prevention similarly the national defence, law enforcement organizations and the administration play the leading roles.

Automatic field and facility monitoring come to the fore in every area of law enforcement as one of the tools of enhancing security.

The police use mobile and deployed thermal cameras, on board cameras in guarding the external borders of Schengen or during EU border policing actions, similarly they use surveillance cameras to provide event security or to detect violence of traffic rules. Many patrol cars are equipped with event recording cameras. Besides other sensors are also applied

⁵ INNOTÉKA Science Innovation Green Economy 2011. May edition, p. 17.

in their activities to protect facilities, to discover intrusions into closed areas like laser-fences, noise and motion detectors. There were tests of cameras mounted on balloons to monitor fields or events.

The National Tax and Customs Administration use various sensors to control shipments or underground objects.

The Prison Guard uses, or plans to use sensor systems for facility safeguarding and monitoring detained persons.

A topic for law enforcement research can be the development of such an overall spatial informatics system, in which automated sensor systems could discover events from their very beginning, then the venues could automatically be recorded on digital maps, could be followed by GPS systems and any interacting motions could be completed with time stamps ensuring their efficient co-operations; by spatial informatics analysis the system could generate deployment practicability, co-operation and effects modelling on the basis of the continuous information communications of the automated sensor systems.

The basis of the uniform spatial informatics system could be provided by the border guards, public space surveillance, the existing spatial informatics systems of deployment control, as well as Robocop.

The military, law enforcement and administration bodies are also big power consumers, therefore it would be important to research the possibilities of the use of alternative and renewable energy resources.

Corkwood nanotechnology granules mixed with carbon can compose such thermal and sound insulating, anticorrosion, wear resistant, infra ray and radio wave absorbing material, the uncountable advantages of which could be exploited in protecting critical infrastructures.

The research network and the clusters could be those links, which could harmonize the compendious standard work of the university with the practical research activities of each partial areas and scientific utilizations, or could make research results public property.

Successful scientific research work cannot be without high level information technology (IT) support. The conditions of IT support are the high speed data transfer network, supercomputers, usage of clouds and grids, as well as the multimedia and spatial informatics displaying, provision of video conference services.

The ZMNDU basically has those requirements, upon which operating of NPSU research network could be built, as the infrastructural requirements for the efficient operation of higher education research networks are available. With the participation of the National Information Infrastructure Development Institute (NIIDI), the Hungarian Internet Society (MIT) and the HUNGARNET Association (Hungarian Higher Education, Research and Public Collection Computer Network Association) the HBONE+, a broad band hybrid data network has been established.⁶. [11], [12], [13]

The HBONE+ is a nationwide backbone network, the task of which is to link the member institutes of HUNGARNET with a wide area, nationwide backbone network, furthermore to provide them international relations, full Internet access. The design and development of HBONE is carried out according to the plans jointly developed by the Technical Council of NIIDI and the managers operating the HBONE network and approved by the leading bodies of NIIDI.

As an achievement of the development of data network infrastructure a so called 'hybrid' data network will be evolved, that is such an optical network infrastructure will be established, which will integrate the IP based, namely the traditional internet based services with the opportunities of a flexibly establishable, managed point-to-point optical circuits. The

⁶ <http://www.hboneplus.hu/node/98> Dr. Zsolt Nyitrai, state secretary for infocommunication inaugurated the new generation hybrid network of National Information Infrastructure Development Institute. From 9th December, 2010, the so called hybrid network will be available in Hungary.

use of hybrid technology is inevitable for remote access to large facilities used in research and development and central databases. As an extra result testing of new data network protocols and technologies (e.g. GMPLS) will appear during the development of the research network, just like the participation in their dissemination. Researchers can participate in complex remote experiments by the use of hybrid technologies (in joint research based on the operation of CERN particle accelerator, fusion experiments, nanotechnology material testing etc.), just like having the equipment and the co-operating partners at the same place, in direct vicinity of each other, in direct system of relations. Establishing such a high demanding infrastructure is especially important when, high value test bases will be established in Hungary playing special roles for European point of views, and in case of this the hybrid database infrastructure can be regarded as basic requirement raised toward the host institute. Meeting the ever increasing education and research demands will be possible with the development of database infrastructures. The high speed backhaul network capacities will be increased as a result of the project and modern network application services will be available for those higher education institutes, which were connected to the network by simple broad band technologies so far.⁷

The hybrid network is developed and operated by the [NIIDI Institute](#). Within the framework of NIIDI Program the development and operation of informatics background of the Hungarian higher education, research and public collection network will be provided by the NIIDI Institute for twenty years. The informatics background of the Hungarian higher education and research will have significant opportunities even in international comparisons. This development will make the GEANT system connecting the researchers of the whole world accessible for the Hungarian researchers, public collections, teachers and students of universities by the use of the most modern technology. This way access will be granted to high value research resources, test equipment, supercomputer capacities, databases of research information, to the tools of remote research, just like to unique large facilities all over the world (e.g. CERN accelerator and processing centres etc.).

The hybrid network essential from the point of view of the international position of the Hungarian research and the competitive strength of the economy is built by the NIIDI Institute based on the so called 'black glass' infrastructure, triggering significant international appreciation with it. DWDM technology built on black glass infrastructure (the top modern technique of putting information on light waves, providing extreme transmission speed) can provide the possible highest transmission capacity.

Dynamic lambda service will be available with this in Hungary for the end users. Following the development 40 Gbps technology will be used in Hungary first in Central Eastern Europe. From 2011 testing of 100 Gbps technologies and IPoDWDM technologies facilitating integrated management will also be possible due to this development.

The development of hybrid higher education and research database is a part of the overall electronic infrastructure development project called HBONE+, which will be carried out by the NIIDI Institute between 2009 and 2011, within the framework of TIOP 1.3.2 project and KMOP-4.2.1/A_2 project supported by NFT2 (New Hungary Development Plan) with involving resources of the European Union. The development of the hybrid network constitutes about the fifty per cent of 4.2 billion HUF investment of the total HBONE+ project.⁸

NIIDI launched its higher education and research video conference education and popularization programme. The momentarily existing higher educational-research video conference system in Hungary has such a technical background, which was only possible to more wealthy countries some years ago. The desktop video conference service launched by

⁷ <http://www.hboneplus.hu/node/25>

⁸ <http://www.hboneplus.hu/node/98>

the NIIDI Institute will flexibly and simply support the daily work of research, education and public collections.⁹

A further goal of HBONE+ project is to provide a real time environment compatible to the European practice, supporting international research co-operations, which facilitates the research and development groups far from each other with high capacity video conference solutions and co-operation supporting tools in the joint solution of their tasks. This is especially important, as the cost and time demand of the scientific, long distance professional journeys increasingly restrain the direct and joint research co-operations carried out at real places. An extra advantage of using video conference system is to significantly reduce the carbon dioxide emissions by decreasing the number of travelling. As a result of the scheduled development the use of collaboration solutions exploiting electronic remote connections – either during research and development work with technical nature, or on the field of introducing the most modern long distance healing services and modern medical educational methods. Such services will enable long distance education, co-operations of research groups far from each other (e.g. organizing project events, joint research co-operations and experiments, meeting of expert committees etc.) on national level, as well as long distance diagnostics or long distance consultations in broader sense. The developments will be connected not only to the existing national systems, but to international similar services established by – primarily European – research networks.¹⁰

Due to the development of gap infrastructure the students of universities can be able to cross-attend between courses without repeated registration procedures, to study otherwise unreachable subjects and to learn new knowledge. Besides, this infrastructure operating on allied base can provide an ample framework to modern e-learning solutions, too. Further result of developing gap infrastructure will be the access of citizens of the universities to wireless networks of other – national and international – universities without separate authorization procedures ("eduroam" infrastructure), and they will have a more simple and efficient access to research, library or publication databases than before (e.g. EISZ). The student and teacher systems will be passable due to all these solutions not only on Hungarian but also on European levels.¹¹

Supercomputers with giant capacities can primarily support tasks with computational demands. They are used in space research, sciences of life, research of physics and chemistry for computation intense modelling, simulations, data analyses, bio-informatics tasks, medical image processing, processing of graphs of scientific workflow, activities demanding distributed calculation infrastructure, meteorological modelling. A supercomputer costs 250 million HUF, in general, contains 1024 processors, has a water cooling system, having huge power demand, 24 TB Memory and 50 PFlops computation capacity. For example BlueGene/Q machine is a similar supercomputer.

The NIIDI Institute provides four supercomputers for the Hungarian higher education institutes together with HBONE+ high speed data network enabling the developing of a grid. The four supercomputers are deployed at the Universities of Szeged, Pécs, Debrecen and at the NIIDI Institute. Main features of these supercomputers are: 50 teraflops capacity, 1536 core 3,33 GHz, 6 TB memory, 500 TB bulk storage, Linux operation system, water cooling, visualisation server with strong graphic card for imaging. Unfortunately, as a consequence of the rapid technical development the appreciation of these supercomputers occurs within 3-4

⁹ <http://www.niif.hu/rendezvenyek/networkshop/97/tartalom/NWS/1/4/index.htm>
http://www.hbone.hu/Workshop2010/hboneplus_arch.pdf

¹⁰ <http://www.hboneplus.hu/node/25>

¹¹ <http://www.hboneplus.hu/node/25>

years, even 50 teraflops capacity will be inadequate next year, as computational capacities are doubled annually.¹²

There are tasks, where even supercomputers are inadequate, therefore grids are developed¹³, in which several supercomputers are interconnected. For example HPC project is such, in which Bulgarian, Hungarian, Romanian and Serbian supercomputers are interconnected. The Hungarian side is represented by MTA SZTAKI, the University of Óbuda and the NIIF Institute in the project. The University of Óbuda develops the users' software, Deep Alinger and Disease Gene.

The hybrid technology enables the developing of grids, namely point-to-point connection besides IP connections can also be built, and dedicated connections can be established between supercomputers participating in a given research. Connections can be established by developing and using the so called 'middleware' (ARC-AREX, gLite). The production of a middleware is a complex programming task. Portal solutions are used to hide middleware, users can have an easier access to remote grid resources with this solution. MTA SZTAKI also develops such portal applications, the gUSE.

The desktop grid includes grids developed from voluntarily participating grids. Those institutes, which have free capacities can offer it for others for their computation tasks. There are researches carried out to facilitate the use of a grid by pairing desktop grids with web2.¹⁴

The cloud is such an IT operation model, in which the users do not need expensive hardware, software applications, IT expert staff, permanent development investment; they only need a simple display, keyboard and a reliable broad band data transmission network.¹⁵

What does this model covers? All hardware, software application are placed somewhere in the world in well protected multi-redundant server farms. Microsoft has a container system, several hundred of servers are operated in one container, which can automatically transfer the processes to other operating servers, in case of failures, and users will not notice anything. When a certain percentage of the servers break down, the whole container is replaced with a new, fully operational container.

IT expert staff can also be found on these server farms, while development is the responsibility of the provider of the server farm, which results the have the most modern equipment and technology available for the users all the time.

The services of the server farm can be accessed via a rented property. For example a given company has typewriting and computation tasks, and then they will rent word processing and spreadsheet services, if it is in Microsoft environment, then some computer of the server park in the cloud runs Word and Excel. The company can run these two softwares in the cloud on its display and data network, its data will be stored in the cloud and only the result will be displayed on the equipment of the company. [14]

What does it provide to the given company? Primarily, saving of investment and operational costs. According to calculations presented on Microsoft Cloud conference on 28 April, 2011, 70 per cent of investment and 50 per cent of operational costs can be saved. Secondly, this company will be on the cutting edge of the innovation competition all the time, as they will always receive the top modern services.

Naturally cloud model may raise questions, too. One of these questions is information security, and the other is dependency. We can easily see the given company depends on the provider of the cloud, as its data is stored with him, just like the equipment which can process these data and not its own offices, in an iron locker, when needed. The other risk factor is the

¹² Stefán Péter Networkshop 2011. Lecture at Kaposvár

¹³ http://videotorium.hu/hu/recordings/details/2738,Szekelyi_Szabolcs_-_NIIF_Cloud_NorduGrid

¹⁴ Marosi Attila Csaba: Desktop Grid in service of Web 2.0, Networkshop 2011. section presentation

¹⁵ http://videotorium.hu/hu/recordings/details/2738,Szekelyi_Szabolcs_-_NIIF_Cloud_NorduGrid

reliability of data connection, data transmission. When it is broken, the given company becomes inoperable.

Providers of clouds can guarantee high level information security, while the legal environment is always modified to guarantee safety.

Studying the development trends of the world neither companies, nor will budget organization have other option than joining the clouds. Technical development is so rapid, new, modern equipment arrive the market so quickly that only some company or budget organization will be able to purchase them, as the time of appearance is only a fragment of the amortisation of the existing equipment. But those, who do not use the newest, would be dropped behind in the race. Therefore there will be no other alternative than the use of the cloud.

Law enforcement organizations will be forced to use clouds, sooner or later. The concern already appears with them that their ten years old computer park cannot meet requirements, but they do not have sources for development.

Chances of using clouds will be granted by HBONE+ project for higher education institutes and public collections. Modern education or a well functioning library cannot be imagined without the use of digital contents, however production and use of digital contents demands fast, modern computers and giant storage facilities. Investment of this magnitude is available to a few institutes only; these services can be leased from HBONE+. Similarly, the university cannot afford research serving considerable R+D+I alone, it can only be done by communities, who cannot be without supercomputers. Joint on-line work and supercomputers for researchers can similarly be provided by HBONE+.

Users, like a university or a municipality can have the top modern, fastest, most reliable info system with a little investment. Naturally, this operation also costs, but by the more the cloud is used, the less the rent will be. Recently an average service costs less then 100 EUR per month.

Use of clouds also requires the change of users' attitude. Some are still suspicious, as they do not have an overlook on infrastructure and data. Clouds have service levels, there is no need to be completely dependent. Only user software can be rented at the beginning, then the infrastructure, when the experience is favourable, than databases can also be placed in the clouds.

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