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## **INTRODUCTION OF CLOUD COMPUTING IN THE LIGHT OF CURRENT LEGAL AND ORGANIZATIONAL SOLUTIONS**

For the past few years, we have been witnessing a dynamic development of technologies related to the widely perceived concept of data processing in the cyberspace<sup>1</sup>. One of the effects of the process is the creation of the so called cloud computing model and sharing it with wide groups of users. The model is a kind of IT service that offers the use of particular resources, computing capacities and memory resources (either as elements to be used separately or together with a ready-made software) to customers that communicate by means of the Internet<sup>2</sup> with the provider that possesses the necessary IT infrastructure. The resources usually include the space in the notional environment that enables the customer to install his IT systems and the computing capacity indispensable for processing the data; they are necessary for the customer to operate with the use of the provided software that enables processing, storing and filing data and information. When discussing the issues concerning cloud computing, several aspects should be considered that concern mainly the contracts with service providers, legal provisions to solve disputes, problems with subcontractors, data sharing within and out of EU and – which seems extremely important in the case of medical data – the security of data being processed in computational clouds.

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<sup>1</sup> Cyberspace is the notional environment in which communications over computer networks occurs PWN Słownik Języka Polskiego <http://sjp.pwn.pl/slownik/2553915/cyberprzestrze%C5%84>

<sup>2</sup> The Internet is a worldwide system of interconnected computers. From the computer science point of view it is an environment of IP addresses assigned to hosts and servers interconnected by such network tools as network cards, modems and concentrators which communicate by Internet Protocol with the application of the telecommunication infrastructure. Source: <http://pl.wikipedia.org/wiki/Internet>

The area of healthcare is specific due to the sensitivity of data processed by the system. As a result, the issue of data processing in healthcare should be taken into account with the consideration of the current and scheduled legal provisions as regards both the system and personal data protection. However, it is the lack of legal regulations concerning several aspects of health data processing by cloud computing that poses a significant problem. In the case of the lack of provisions dedicated to health data, most regulations that are general in character will be insufficient as regards such sensitive information as medical data.

The whole problem requires adequate regulations both in EU and Poland. In the publications on that problem<sup>3</sup> a thesis can be encountered that private cloud computing and – in some cases – a hybrid one are acceptable in healthcare sector. The application of public cloud computing in health data processing is excluded as a rule. However, in many cases entities functioning in healthcare use such type of cloud computing (e.g. e-mail service to transfer medical records) – frequently without realizing the fact.

Private cloud is located either in or off the premises of a health unit. In the first case, the user has a full control over the tools that generate the cloud. In the latter, the user applies the resources of an external entity that are available without sharing with other users. In such cases the contract should indicate a precise location of the cloud facilities.

Private clouds enable a full use of all the advantages of cloud computing without putting at risk the data being processed –the sensitive data in particular. The security of data in cloud computing includes the protection of information and information systems against an unauthorized access and usage. It should also protect data against disclosure, distortion or damage in order to ensure:

- integrity, which means the protection against improper alterations or damage of the information and assurance of not rejecting as well as the authenticity of information;
- confidentiality, which indicates the maintenance of the accepted limitations of access and disclosure, including privacy as well as company information protection measures ;

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<sup>3</sup> Nyczaj K., „Jak bezpiecznie archiwizować elektroniczną dokumentację medyczną”

- accessibility, i.e. the assurance of timely and reliable access to the information and its use<sup>4</sup>.

Unfortunately, private clouds have several disadvantages. The major one is the relatively high cost of developing such a model (one that would meet defined standards) or using the services of an external entity that develops such models and offers them ready to use. The development of such a model involves several other problems which may affect the decision on choosing it. They are as follows:

- even big corporations will have problems with reaching the scale effect (and consequently discounts from hardware and energy suppliers) that is typical for public clouds,
- the transition of the existing applications to a cloud model is difficult – real profits are generated after the change of the application architecture,
- the fact that the server is located on the premises does not imply the security of data; Google or Amazon may have a better experience in dealing with hacker attacks; encrypted data in public cloud may be safer than the unencrypted ones in private clouds. Company buildings usually do not have proper electric generators in case of emergency,
- private clouds will always be one step behind as regards innovativeness, the Google or Amazon companies specialize in that.

The U.S. Government Cloud is an example of a private cloud that is used on a large scale. The Amazon company announced the creation of GovCloud, which is dedicated to U.S. government agencies and developed in accordance with the requirements of government institutions. GovCloud includes *Amazon EC2*, *Amazon S3*, *ESB*, *Amazon VPC*, *IAM* and *CloudWatch*. When connected together, they form a cheaper and safer alternative to the solutions that are used by the American administration at present. The aim of that initiative is to reduce the maintenance costs of the government data centers without the decrease of the high level of security. Vivek Kunda, CTO to the Federal Government declared that a new model is required that would lower the costs and increase the innovativeness, and that it is the government's duty

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<sup>4</sup> Report of the Committee on the Internal Market and Consumer Protection of EP „Chmura obliczeniowa – Ekspertyza” (Cloud computing – expertise)

to solve problems and not to run data centers. At present, in order to reduce the costs, it is recommended to implement in public clouds applications that are not encrypted<sup>5</sup>.

It can be expected that private cloud computing will also be developed in EU countries to be used in for the needs of administration, healthcare including. In November 2012 a European Cloud Partnership was founded, aiming at the co-operation between the administration and companies that are potential service providers. The project objective is to implement various aspects of cloud computing. The main aim is to ensure the security of data being processed in clouds and to maintain the continuity and quality of the services. There will be an attempt to standardize legal systems of EU member states. As the work includes the European cloud - apart from the administrations of some countries - several entities that are of European origin or operate in Europe have been invited to co-operate. For unknown reasons not all countries have been invited to join the project.

The aim of the project is to develop a private cloud computing model for public administration with the consideration of different levels of the cloud and the transition from the current model of IT and IC infrastructure to cloud computing solutions. Moreover, the stability of EU projects under development also has to be considered. The project includes the arrangement and further development of standards concerning the security, inter-operativeness, transfer and reusability of data, the protection of personal data and certification of cloud computing systems. Moreover, fair and honest contractual terms concerning the guaranteed level of cloud computing service will be formulated (*Service Level Agreement - SLA*) to be applied in agreements between cloud service providers and professional users<sup>6</sup>.

Hybrid models – offered, among others, by the Amazon - are another interesting solution. They make it possible to combine private and public clouds through VPN<sup>7</sup>, thanks to which inefficient private resources can be supported by public ones – the concept is referred to as cloudbursting. That can be illustrated by the example of unexpected guests. When they come, the hosts do not buy a new house but they find the accommodation for the excess guests in a nearby hotel. In the case of the Google, the *Secure Data Connector* is an equivalent of such a solution.

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<sup>5</sup> Karpiuk P. Chmury obliczeniowe. Źródło internetowe: <http://blog.tiger.com.pl/inne/chmury-obliczeniowe/>

<sup>6</sup> Based on: State Integrated Informatization Programme, Warsaw, November 2013, Ministry of Administration and Digitization

<sup>7</sup> *Virtual Private Cloud (VPC)* is a kind of cloud computing where the provider shares a part of the space in his public cloud, thus turning it to a private cloud. Although the VPC infrastructure is managed by the provider, the data and any other resources in the private space are not accessed by other users. Source: Virtual Private Cloud (VPC) <http://www.techopedia.com/definition/26814/virtual-private-cloud-vpc>

One of the VPC's<sup>8</sup> atypical applications is the recovery of a data private center after a breakdown – it happens that in such cases another data center is required, e.g. in a public cloud that stores a back-up copy<sup>9</sup>.

There is often a dilemma how to distinguish a cloud from a structure similar to it. That problem is significant as regards legal issues, especially in healthcare sector, where substantial amount of health data and information is processed.

As cloud computing can be confused with hosting services, table 1 presents a few fundamental factors that differentiate a cloud model from earlier solutions.

*Table 1. Selected differences between cloud computing and hosting*

<b>Hosting</b>	<b>Cloud</b>
<p><b>Effectiveness</b> - no centralized mass memory. Users do not know with whom they share a particular physical server, the number of virtual servers operating at a given moment or the type of operations in progress.</p> <p>When there is no physical server, it is not possible to transfer the data or software to a different physical machine – such a process may take hours if not days.</p>	<p><b>Effectiveness</b> – centralized mass memory, which results in the fact that the activity of other virtual machines in no way affects the data speed access. The servers operating in real cloud are not limited in any way by the current data accessibility: in the cases of insufficient memory or processor's capacity, the server in the cloud is transferred to another physical machine with free resources and the process is unnoticed by the user.</p>
<p><b>Scalability</b> – Typical virtual servers with assigned amount of resources, without the possibility to change due to the level of current load of the application that is under operation</p>	<p><b>Scalability</b> – auto-scaling technologies provide the server with the currently required amount of resources. The increase of the capacity is immediate and automatic.</p>
<p><b>High accessibility</b> – inability to maintain a full synchronization of servers for the whole time and the interconnection of the mass memory with the physical server. Every failure of the physical servers means the end of the user's virtual machine, at least to the moment when the failure is removed.</p>	<p><b>High accessibility</b>- the provision of redundant mass memory and automatic transfer of virtual servers between physical nodes in case of a breakdown – such a server may be started instantaneously on any node with a sufficient amount of resources.</p>
<p><b>Fees</b> – server in the network, with its own IP address and full control over the operating system of the dedicated servers. Activation fees and long-term agreements - a common case</p>	<p><b>Fees</b> – the user is charged for the actual service: the cost is calculated by the ordered power capacity and resources multiplied by the number of hours of the server operation in the cloud.</p>
<p><b>The future</b> – co-hosting, due to its significantly low price, will be used in simple tasks for a long time.</p>	<p><b>The future</b> – Servers operating in clouds have equaled the VPS<sup>10</sup> (and are frequently cheaper) while reaching reliability, effectiveness and elasticity that are inaccessible to VPS</p>

<sup>8</sup> *Virtual PrivateCloud* (VPC) is a kind of cloud computing where the provider shares a part of the space in his public cloud, thus turning it to a private cloud. Although the VPC infrastructure is managed by the provider, the data and any other resources in the private space are not accessed by other users. Source: Virtual Private Cloud (VPC) <http://www.techopedia.com/definition/26814/virtual-private-cloud-vpc>

<sup>9</sup> Karpiuk P., Chmury obliczeniowe. źródło internetowe: <http://blog.tiger.com.pl/inne/chmury-obliczeniowe/>

<sup>10</sup> VPS is a virtualized dedicated server. It practically allows for any operations as a dedicated server. The customer receives root access and has the possibility to install his own applications and configure them as required. VPS has its own system of files, processes, users, applications and resources allocations which ensures a complete control over the applications and resources of the server. Source: <http://hitme.net.pl/cotojestyvps>

Source: Authors' study based on: M. Kuźniar „o chmurach i niechmurach, czyli czym się różni cloud computing od zwykłego hostingu.” (about clouds and non-clouds, i.e. how cloud computing differs from typical hosting) <sup>11</sup>

Hosting services have been used by entities offering healthcare services for many years now. Two types of hosting can be distinguished: dedicated and simple. Dedicated hosting services<sup>12</sup> consist in assigning the customer a guaranteed power of a server, frequently a defined one, with the possibility to provide the computer's number and location address. Simple (shared) hosting functions in a slightly different way as its characteristic feature is that servers that offer the space are virtual. The resources of the virtual server are assigned to a particular entity but are shared with other customers of the provider.

The entity offering healthcare services should be able to see the difference between cloud and hosting services. However, IT entities often offer both types.

As it was indicated in the article devoted to legal regulations on cloud computing, in fact there are no legal provisions referring directly to that problem. Some assistance came from GIODO (Inspector General for Personal Data Protection) who published *Ten principles on cloud computing use by public administration*.<sup>13</sup>

It is an open question whether an entity with cloud resources can process healthcare data that are stored in – for example – digital medical records or databases deposited at the entity. It is important to indicate that according to the statutory definition, data processing is understood as collecting, recording, storing, developing, altering, sharing and removing data, especially when conducted by IT systems. The definition implies clearly that in accordance with the act, any operations on data are referred to as processing. Thus, a question arises whether any operations on digitized medical records can be performed by entities that render services technological in character. It seems – when healthcare data are concerned – that it is acceptable to use only the models that ensure a full control over the data by the entity taking advantage of cloud computing. Such a control is possible in the following cases:

- *hoteling*, collocation – i.e. a service (usually related to IT) that consists in placing customer's equipment on the premises of the service provider, who is also responsible for maintenance services<sup>14</sup>,

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<sup>11</sup> <http://www.spidersweb.pl/2012/12/maciej-kuzniar-chmurach-niechmurach-czyli-czym-sie-rozni-cloud-computing-od-zwyklego-hostingu.html>

<sup>12</sup> *Hosting* is the provision of server resources by an Internet service provider. Source: <http://pl.wikipedia.org/wiki/Hosting>

<sup>13</sup> Source: GIODO [http://www.giodo.gov.pl/259/id\\_art/6271/j/pl](http://www.giodo.gov.pl/259/id_art/6271/j/pl)

<sup>14</sup> Source: <http://pl.wikipedia.org/wiki/Hoteling>

- *hosting* of a dedicated server<sup>15</sup> - a separate computer offered to a defined customer by hosting companies that plays the role of a server. The customer can install the software on the server and configurate the operating system that was installed and configurated by default.

It can be assumed that in small entities such as medical or nursing consulting rooms that are run by one person, a private cloud, or possibly personal clouds<sup>16</sup> can operate in accordance with the provisions of law. However, that does not solve the problem of big professional cloud resources. There is a question whether pursuant to the existing provisions, it is acceptable to transfer medical records or healthcare data (stored in a database, for example) to professional centers that offer hosting services. It is obvious that data can always be processed upon the consent of the concerned person if he/she is informed about the risk involved with data processing. In the case of healthcare data it must be a consent in writing. Practically, it may be difficult to do as such a procedure requires storing a substantial number of patients' declarations with either their consent or the withdrawal of the consent. At present, such documents would be in physical form due to the fact that very few people can use electronic signature or a trusted ePUAP profile, which would have to be used when making a will of consent electronically.

If an entity that renders medical services uses the services of an entity offering hosting services, one has to consider the choice of an adequate service provider and, particularly, the guarantees that are offered as regards the protection of personal data. A health care entity that plays the role of an administrator should by definition decide not only on the objectives but also on the data processing resources. As a result, the service provider should inform the medical entity that has the right to process data about technical means applied and obtain its acceptance.

It should also be pointed out that the virtual space of data processing, i.e. the space of cloud computing, should be taken into consideration by the security policy of a medical entity. Due to the fact that in cloud computing sensitive data are processed, legal provisions are applied

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<sup>15</sup> Source: [http://pl.wikipedia.org/wiki/Serwer\\_dedykowany](http://pl.wikipedia.org/wiki/Serwer_dedykowany)

<sup>16</sup> A small server at home or a small commercial network which can be accessed by the Internet. Personal clouds, which are designed to store and share private information, make it possible to browse and send data from any personal computer connected to the Internet or, frequently, from commonly used smartphones. Although personal clouds function similarly to any private clouds developed by companies, their main property is the simplicity of installation even for an average PC user. Report of the Committee on the Internal Market and Consumer Protection of EP „Chmura obliczeniowa – Ekspertyza” (Cloud computing – expertise)

that oblige<sup>17</sup> the data administrator of the entity to apply high level security measures with regard to the transfer of personal data between the service provider and the “outer world”. They include data cryptographic protection and encryption tools used for authentication when in a public network.

The right to process healthcare data, cloud computing included, has been granted to particular groups of people. The Act on personal data protection imposed the rule that sensitive data processing is forbidden. However, the act introduced several exceptions. Such an approach determines the ban on the extension of the interpretation beyond the closed catalogue of exceptions.

Legal provisions regulate the cases and entities that are entitled to process healthcare data. Such data can be processed with the aim to protect health, render medical services or treat patients by people whose profession is to treat patients, as well as to offer some other medical services or manage medical services when there is a full guarantee of personal data protection.

The group of people who manage healthcare services includes broadly defined management and staff who – as a result of their responsibilities – must deal with healthcare data, i.e. employees dealing with statistics, medical secretaries and computer staff. It is obvious that they can have the access to data processing after being authorized by the data administrator. The authorization results in the obligation to maintain the confidentiality both of the data that they are authorized to have access to and the methods of their securing (computer confidentiality).

There are numerous advantages of cloud computing. As a result, it is developing dynamically across the world. The application of cloud computing in Poland is comparatively widespread. A part of such services is extremely common, e.g. e-mail services. According to CISCO, 42% of corporations took advantage of such solutions in 2012<sup>18</sup>.

It seems probable that some services in Poland will require licensing in order to guarantee an adequate trust level on the part of healthcare service providers and patients, which may occur

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<sup>17</sup> The Regulation of the Minister of Internal Affairs and Administration of 29 April 2004 on personal data processing, documentation and technical and organizational conditions that should be fulfilled by devices and systems used for the processing of personal data (Journal of Laws, 2004, No. 100, item 1024)

<sup>18</sup> Source”: <http://biznestrend.pl/artykuly/1211/Coraz-wiecej-polskich-firm-trzymaj-dane-w-chmurze>

when the providers of cloud computing will meet such criteria as trust, reliability of services and the possibility to monitor the compliance of their operations with law provisions<sup>19</sup>.

The first stage of the implementation provides for the development of cloud computing for local government units. The project will be conducted in a rather limited range. The main objective is to test the mechanisms of cloud computing, to implement the co-operation system with local government units and to develop a financing model of cloud solutions that will be used by such units.

The development of a **National Cloud Computing System** is planned that will serve the institutions of state administration as a technological environment to construct, test and launch applications with a limited range that are developed to render services or to support the entities' primary activities.

European Union has a different approach to the issue of sensitive data protection, healthcare data included. It seems that **sensitive data processing centers** will be founded. It is expected that they will be located extraterritorially and will be capable of storing sensitive data of different countries. It is difficult to predict if that idea will be sustained in the course of future work.

Cloud computing seems to be particularly attractive as regards the implementation of commonly used digitized medical records, the electronic prescription, placing orders for medical products and repairs, referrals for examinations or certificates of incapacity to work (the so called L4 form)<sup>20</sup>. Cloud computing is a model for all healthcare and medical entities that operate on the market. However, first of all, it is a great opportunity for small entities to take advantage of currently updated software, the computing capacities and practically unlimited resources for data recording. The fees for such services depend on the user's activity. On the basis of the hitherto use of cloud computing services, it can be predicted that in the nearest future it will be in fact the only solution for medical consulting rooms that function without a direct contact with the NFZ (the National Health Fund) and - in line with the new regulations - are obliged to transfer the data to the healthcare information system. It should be pointed out that the cloud

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<sup>19</sup> Complete minutes of the meeting of the Commission on Innovativeness and New Technologies (No.86) of 11 September 2013, Chancellery of the Parliament, Committee's Bureau), Kancelaria Sejmu, Biuro Komisji Sejmowych

<sup>20</sup> Draft of the amendments to the Act on cash benefits under social insurance in the event of sickness or maternity and other acts. BIP MPiPS <http://www.mpips.gov.pl/bip/projekty-aktow-prawnych/projekty-ustaw/ubezpieczenia-spoleczne/ustawy-o-zmianie-ustawy-o-swiadczeniach-pienieznych-z-ubezpieczenia-spolecznego-w-razie-choroby-i-macierzynstwa-oraz-niektorych-innych-ustaw-/#akapit5>

priver offers several services that at present belong to the responsibilities of the entity processing the data. Among others, they provide the security of the data and information being processed in the cloud, and the service is by far more technologically advanced than that at the disposal of the entity with its own computer system,

Unfortunately, despite evident benefits of cloud computing, there are numerous threats that regard mainly the **security of data**. The problem is particularly important when considering healthcare data processing as the processing of sensitive data. At present, that is the main barrier to the development of cloud computing services in healthcare sector.

On 1st July 2012, an independent consulting entity of the European Parliament and Council, the so called Article 29 Working Party<sup>21</sup>, adopted the opinion on data processing in cloud computing. The opinion took into consideration, among other things, the hazards concerning personal data processing in cloud computing. They may also be referred to the data and information that is processed in healthcare sector. The main threats are as follows:

- service providers apply their own standards and technological solutions, which results in significant problems as regards the transfer of data and documents between different cloud computing systems and the exchange of information between the entities that take advantage of cloud computing administered by other providers (interoperability).
- Personal data that are stored in clouds are frequently processed in various geographical locations. That has a direct impact on the law governing any disputes as regards data protection that may appear between the customer and provider. The lack of control over the data being processed by cloud computing is caused by the legal situation of the cloud provider which is often obliged by law to make the data available to authorities without the necessity to inform the customer about the situation. A good example of such a situation is the resolution of the dispute between Microsoft and the US administration over the duty to reveal an e-mail of one of the customers in relation to a drug trading investigation. Microsoft turned over the e-mails stored in US servers but refused the access to customer's data that were stored in a cloud server located in Ireland. The U.S. Federal District Court, confirmed the decision of the magistrate court and concluded that the U.S. administration has the right to demand from the Microsoft its customer's data that are held in a cloud located beyond the U.S. The search warrant that demands a release of data from servers located in other countries does not constitute an extension of

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<sup>21</sup> <http://www.giodo.gov.pl/1520123/>

American law enforcement beyond U.S. borders and does not violate the sovereignty of other countries<sup>22</sup>.

- A significant number of subcontractors and the lack of information about them leads to the situation that it is impossible to indicate what entity processes the data stored in the cloud, healthcare data including. It happens frequently that there is a whole chain of service subproviders, which makes it impossible to intervene due to the fact that the entity that is processing the data cannot be identified. The problem involves both the entity that entrusted the data to the cloud as the individual whose data are being processed and who wants to take advantage of the right to access his/her own data and correct them.

The transfer of personal data between the entities within and out of the EEA<sup>23</sup> causes significant problems. That is due to the fact that the global website does not take into account geographical divisions. It is a rule that personal data, healthcare data including, are allowed to be sent to the EEA countries. They can be sent to other countries only when they ensure an adequate level of security<sup>24</sup> or belong to Safe Harbor<sup>25</sup> and in such cases additional conditions are not required. In other cases the transfer of data has to be protected by adequate means, i.e.:

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- Standard contractual provisions, i.e. a set of suitable model contractual regulations developed by the European Commission;
  - Binding corporate rules, i.e. the possibility to accept data security principles of a particular corporation. When the principles are approved and accepted by adequate

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<sup>22</sup> Ścigani w chmurze czyli amerykański rząd przeszukuje zagraniczne serwery Microsoftu. Source: <http://blog.e-prawnik.pl/scigani-w-chmurze-czyli-amerykanski-rzad-przeszukuje-zagraniczne-serwery-microsoftu.html>

<sup>23</sup> European Economic Area was established in 1994 to provide for the possibility to apply EU internal market regulations in the EFTA member states. Source:

[http://www.europarl.europa.eu/aboutparliament/pl/displayFtu.html?ftuId=FTU\\_6.5.3.html](http://www.europarl.europa.eu/aboutparliament/pl/displayFtu.html?ftuId=FTU_6.5.3.html)

<sup>24</sup> On the basis of Article 25 (6) of directive 95/46/EC the European Commission is given the power to determine whether a third country ensures an adequate level of data protection by reason of its domestic law or of the international commitments, particularly after the completion of negotiations with EC in the area of protection of privacy and fundamental rights and freedom of individuals. A positive decision of EC means that the country guarantees the same protection as on the territory of the Republic of Poland. The decisions concerning the transfer of personal data differ in character and application range. Source:

[http://www.giodo.gov.pl/163/id\\_art/1519/j/pl/](http://www.giodo.gov.pl/163/id_art/1519/j/pl/)

<sup>25</sup> US, as a rule, do not ensure an adequate security level. However, it is guaranteed by some American business entities that have the Safe Harbor certificate, although it should be remembered that their membership in the Safe Harbor programme can be selective, e.g. it can apply only to their own personnel data. Gawroński M. [ed.], Cloud Computing w Sektorze Finansowym. Regulacje i Standardy (Cloud Computing in Finance Sector. Regulations and Standards) . Source:

<http://www.twobirds.com/~media/PDFs/PolandPDFs/Cloud%20Computing%20w%20Sektorze%20Finansowym%20Regulacje%20i%20Standardy%202011.pdf>

personal data protection authorities, the corporation is considered a safe data processing area, where personal data are protected on the level required by UE.

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The exports of data to a country that does not ensure an adequate security level can be conducted with the consent of the GODO (Inspector General for Personal Data Protection). In order to obtain the consent, the data exporter has to ensure that the data importer guarantees adequate protection of the privacy and the right and freedom of individuals concerned. Most frequently such a guarantee is constituted by a suitable agreement between the data exporter and importer. Theoretically, data exports to a state that does not guarantee an adequate security level can be carried out without the GODO's permission. However, such situations – although stipulated by law – happen exceptionally<sup>26</sup>. The considerations on cloud computing in healthcare sector should be compared to the current plans concerning the general issues of healthcare computerization.

The rate of technological changes that offer numerous attractive practical solutions as well as the existence of legal loopholes caused by the inability of law to catch up with the dynamic development of technologies will result in a range of solutions that aim at circumventing the loopholes. Nothing will stop the changes and, consequently, it is necessary to find solutions that would legalize both healthcare data processing in clouds and the methodology of data processing being applied practically by the entities at present. That is the case with teleconsultations, which - despite the lack of regulations or sometimes even against them – are functioning and developing very well.

At the end it is worth presenting the most important tasks of the healthcare sector in the nearest future that will be mainly related to the application of cloud computing (Table 2):

**Table 2. Implementation priorities of healthcare e-services**

1.	Running and managing individual patient's medical records;
2.	Access to the complete medical records of customer as regards certification; cross-border exchange of information and data regarding medical events and international sharing of individual medical records with the consent of the patient or a medical person authorized by the patient;
3.	Teleconsultations between medical staff in the context of the exchange of medical records as well as facilitating a joint access to the records in the course of consultations and the registration for non-specialist services;
4.	Remote consultation of medical cases and teleconsulting and telemonitoring services together with the

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<sup>26</sup> Cloud Computing w Sektorze Finansowym Regulacje i Standardy (Cloud Computing in Finance Sector. Regulations and Standards), Maciej Gawroński (ed.)  
<http://www.twobirds.com/~media/PDFs/PolandPDFs/Cloud%20Computing%20w%20Sektorze%20Finansowym%20Regulacje%20i%20Standardy%202011.pdf>

	cross-border information exchange with the selection of optimal treatment methods;
5.	E-prescribing, which enables, among other things- obtaining on-line information on medicines prescribed to a patient or prescribing medicines without the visit to the doctor's (in the case of chronically ill patients who take the medicine on a permanent basis); information on the availability of medicines.
6.	E-referrals to treatments – which enable on-line registration to further treatments in a selected entity and the access of services providers to the assigned referrals through the On-line Patient's Account (IKP).
7.	E-orders – the service for healthcare entities that increases the effectiveness of supply in medicinal products and medical devices;
8.	Sick e-leaves (service integrated with the e-service provided by the ZUS Social Insurance Institution) – will help eliminate sending by service providers paper copies of sick leaves to the ZUS; patients will not be obliged to submit their sick leaves to the employers; service providers will save time on issuing them.
9.	e-registration – online registration of appointments (with the application of the identification through, among others, Trusted Profile)
10.	The introduction of social security e-card – the card will make it possible to confirm – among other things - the right to healthcare services and will also confirm the completion of the service;
11.	E-learning for healthcare personnel, management and other individuals in the field of information and communication systems that operate within the healthcare sector; the access of the public to training programs in healthcare education.

Source: Author's elaboration based on State Integrated Informatization Programme (PZIP)

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### ***Abstract***

Healthcare sector is a specific area due to the sensitivity of data being processed in the system. As a result, the issues of data processing by cloud computing should be considered in the aspect of the unique properties of healthcare system and with regard to the current and future legal regulations that concern both the system and the protection of personal data. The article presents the prospects and problems related to the potential implementation of cloud computing in the Polish healthcare system. Legal regulations and organizational requirements imply the need to analyze thoroughly and adapt cloud computing models to particular requirements. The article discusses private, public and hybrid models of cloud computing together with the hosting and hoteling services that may potentially be implemented.