



HR Verilerinin Korunmasında Yazılım Mühendislerinin Rolü

Software Engineers Role in Protecting HR Data

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ÖZET

İnsan kaynakları departmanı önemli çalışmalarını sürdürmekten sorumludur. İnsan kaynakları bilgi sistemi birimi, toplumun en önemli fonksiyonel birimlerinden biridir. HRIS biriminin ana sorumluluğu kuruluşların veya şirketlerin verilerinin korunmasıdır. Yazılım Mühendisleri, HR departmanında, HR verilerinin bu yazıda belirtilen çeşitli programlar ve teknikler aracılığıyla korunması konusunda büyük bir rol oynamaktadır. Onların çalışma doğası çeşitli kariyer türlerini içerir. Genel olarak, HR'yi tehditlerden, siber saldırılardan ve HR sistemini en iyi şekilde koruyan araçlar ve teknikler kullanarak bu sayede verilerin korunmasını ve doğru bir şekilde kaydedilmesini sağlamaktadırlar.

Anahtar Kelimeler: İnsan Kaynakları (HR); İnsan Kaynakları Bilgi Sistemi (HRIS); İnternet Kontrol Mesajı Protokolü (ICMP).

ABSTRACT

Human resource department is accountable for keeping up significant work. The unit of human resource information system is one of the most important functional units of community. The main responsibility of HRIS unit is protecting data of organizations or companies. Software Engineers play a great role in HR department, which includes safeguarding of HR data via several programs and techniques as mentioned in this paper. Their nature of work includes various kind of life

carrier, so they are protecting data and saving data in a proper way via using tools and techniques that keep HR away from any threats, cyber-attacks and protect HR system in the best way.

Keywords: Human Resource (HR); Human Resource Information System (HRIS), Software Engineering.

1. INTRODUCTION

Human resource department deals with planning resources and allocating good structuring organizational policies. HR department is at all times accountable for keeping up the good work, organizing events and guaranteeing the smooth functioning of work approaches of an organization. Human resource information system (HRIS) unit is belonging to HR department, and one of its major responsibility of HRIS unit is to keep data from leaking and blocking it against attacking threats and cyber attacking, as well as gathering, keeping, maintaining, protecting and safeguarding data that is required by an organization through human resources. There are some important departments that are not technical such as HR, but it covers and protects their data by software engineer's support. In this paper, all aspects of protecting data are clarified, which are done by software engineers.



Whenever data reviews by HR department; there are some important data considers as confidential data. For that reason, it has to be protected from leak of outside the department. Hence, the roles of software engineers begin with protecting this data and saving them in a proper way.

Software engineers can easily guard HR department from the cyber-threats via using tools and techniques in a proper way. Highly classified management data in 21st century will be recognized for its data upheaval via technical innovation. Furthermore, the transmission of such data through human resource information system must be under a supreme control. HRIS will encourage protecting data rapidly which permits speedy investigation of HR issues and not allow any threats on data. HRIS is considered as a compelling instrument of administrators to take successful choices [1].

HRIS unit has a great role in assisting software engineers to become one of the great significant and active units in the community, which protects most of the sensitive and critical data that is related to HR unit. The general and private environment of HR in the community can achieve many competitive advantages, which enable software engineers to meet the challenges of the framework, ensure continuity on one hand and be surviving on other hand through the role of software engineer's in HRIS unit.

2. ROLE OF SOFTWARE ENGINEERS IN SAFEGUARDING HUMAN RESOURCE INFORMATION

Safeguarding is related to the information or data that is available in the system. Whenever data passes through system from a PC to other PC, data protection is required. It is one of best way to avoid data from hacking and threatening as well in order to safeguard HR data and to not let data to be locked or replaced by other data within the system that might be done by employees, clients and trading partners. The software engineers have to do the following procedures:

- Utilize techniques of using methods of multi factor of the authentications.
- Authorize safeguards to alert when significant data is about to leak by a client and avoiding it from spreading.
- To be careful when a regular data has been backed-up and saved in a good place to safeguard data in order to block it from a sudden leakage situation.

- To encrypt essential information in order to know where is it being saved? And when will it move.
- To train and enrich the users to use unbreakable password and username.
- Monitoring the users to control the access of the systems.
- Having to include liability and responsibility for the employees who safeguard the classified data.

In spite of the fact that the delicate data can be scrambled when its being put in a non-unpredictable memory as a hard plate, for some online business and system applications, touchy data is regularly being placed as a plain text in fundamental memory [2]. That's why below points have to be taken into serious consideration:

Classify Sensitive Level of Input Data

Information may be required for legitimate or moral reasons, for issues related to individual protection, or for exclusive considerations, since sensitive input data is very important to be protected and to be kept away from leakage to remain safely and be protected from unauthorized access to defend the security (security of a person or organization). There are three primary sorts of sensitive information:

- Personal Data: Delicate is actually an identifiable data or information that belongs to a person, which there is a chance of being uncovered; also the leakage might hurt that person.
- Data incorporated sensitive biometric information, identifying restorative data.
- Budgetary data is one of a most important data that needs to keep away from leakage, such as salary and promotions or social security number, or a robbery done by an individual and the leakage of the same might cause a bad impact.

HR's characteristics decide the consequences of new development in financial advancement. In the period of enormous information, the development of keen training cloud be helpful for HR development when all is done in an area of sensitive information input [3].

Classify Access levels of the Shared Folders

Shared folder is one of the ways to protect HR data, software engineers have to restrict and limit the access according to individual employees, and exterior trade accomplices that collaborate on an extension, as it will need collaborators to have diverse levels of control over the records within the organizer to secure against the



cancellation records and other unauthorized adjustments.

Shared folders are a casual sharing system normally reached out from clients' nearby, with basically an indistinguishable representation and usefulness from nearby progressive organizers on PCs. Insignificant tenets are worked in the framework regarding how various individuals access and utilize the program [4]. Computer program engineers such as software engineers give the capacity to dole out diversity to get to levels of venture organizers.

Using Modern Technical Encryption Solution

Encryption is to interpret information into another frame, or code, as it individuals have access to a vague key formally called a decryption key or password can read it. That's why software engineers have to use one of the technical encryption solutions to protect HR data, currently cloud solution is one of the best ways, which is used for that purpose. Security information arrangements for encryption can make encrypting devices, email, and information itself. In numerous cases, the encryption of these functionalities are also coincide with controlled capabilities for gadgets, email, and information.

When it comes to private sectors such as companies and organizations, these institutions confront the challenge of securing information and avoid information misfortune as representatives utilize outside gadgets, detachable media, and internet applications more frequently as a portion of their every day trade methods. Delicate information may not be beneath the company's control and security as representatives duplicate information to detachable gadgets or transfer it to the cloud. This capacity to stay stateless liberates framework engine to viably oversee server stack adjusting and other speed issues. Furthermore, by isolating the state data from vital venture information [5].

HR Storage and Data Management

The phrase storage and data management include the technologies and forms organizations utilize to maximize or get well the functioning of their data storage space property. It is a broad category to incorporate virtualization, replication, mirroring, security, compression, interchange analysis, and handle automation, storage provisioning plus associated techniques. By a few gauges, the quantity of computerized data stored inside the world's computer frameworks is repetition all year.

As an effect, HR sense unremitting force to grow their storage capacity. But, repetition HR's storage capacity every year is a costly proposal. In order to decrease some of those costs and improve the capabilities and safety of their storage arrangements, organizations turn to a type of storage administration techniques are used by software engineers. The most widely recognized issue experienced is in turning upward of the documents in the files of the HR offices where it is still physically perused by the staff and a large portion of the records are not in legitimate request [6].

Protecting disk and EFS Encryption Method

Protecting medium of storage such as HR disks and memories are software engineer's tasks, in numerous HR department in the company recruit software engineers in the mentioned department to protect HR disks and encrypt it, when HR employee share desktop computers. Several users tour among moveable computers in the organization so as to they handle remote the physical protection of the HR storages. This means that costly data is regularly ahead of the HR department. An unapproved client may endeavor to peruse information put away on organization, if a compact personal computer can be stolen. In these situations, malicious gatherings can access delicate HR information.

There are several solutions to encrypt HR data through medium; one of these solutions is to assist decrease the probable to prevent from violence data have to be encrypted especially the sensitive files by using method of Encrypting File System EFS to amplify the safekeeping of your data. Encryption is the process used by software engineer, which is consist of the numerical algorithm in order to build data impenetrable excluding to clients have account of the demanded key.

EFS are made by several security companies but one of the best companies is Microsoft technology [5, 8]. It permits to the users to encrypt data through personal computers also to control decryption. When files have been ready for encryption, the user data cannot be able any more to read the data, as well as hackers, if they have got the physical type access of the computer's data storage because it became safe. For more ensuring using EFS is one of the solutions to safeguard data, that's why all users should have Encrypting File System Certificates which is consists of digital records that lets their users to encrypt and decrypt data by using technology of EFS, the users should also have NTFS for authorization to regulate the files.



3. SOFTWARE ENGINEERS ROLE IN PROTECTING HR FROM CYBER ATTACKS

Currently, cyber attacking is one of the common ways of attacking; so cyber-attackers are looking for an easy path to access and reach their goals whether in the companies or organizations. According to hackers' perspective, HR is one of the important units, which is an easy objective for the hackers and it is one of the primary places that might be attacked. HR became a common target because there is important information of the company and the community saves there such as salaries amount, ID number and all personal information also HR employees have privilege to access data, which is attractive by outside company like dark internet as well. Software engineers have to keep these data and prevent it not to get into hand of attackers. So attackers do their best in order to get this information, attackers have several vulnerabilities to get access of HR system, such as spoofing and phishing, HR has to respond the attacks by hiring software engineers in HRIS unit in order to prevent and not allow cyber-attacks.

The companies have to provide full support to software engineers in HRIS unit via providing enough equipment and security devices; so that they could be able to stop this kind of attack. Furthermore, software engineers have to train HR people and other employees, so that they could be protected from tricks and embracing practices that protect data, and checking vendors of cloud-based HR technology. Cyber assaults against touchy information have progressed toward becoming as genuine dangers everywhere throughout the world because of the rising uses of PC and data innovation. New malware or pernicious projects are discharged ordinary by digital lawbreakers through the internet trying to take or obliterate imperative information [7].

4. MAINTAINING AND MANAGING HR SERVERS

One of the most important assignments of the software engineers in HRIS unit is to secure and take care of the computer servers, since the servers are the most pool where all HR information collected there, any assault or harm against the HR servers implies assault of the company. It gives back for a number of administrations that eventually serve the reason of expanding server security and making it safe to hacking and disrupt through strategies that guarantee coherence of execution and compatibility with computer program

introduced on it. Software engineers main task are changing over, handle internet and computer applications [8].

The servers act as middle facility between the domestic arrange and the intranet. They make demands appear on the intermediary address on client's intent by utilizing IP address rather than client address. It is software engineer's responsibility and task to maintenance and managing HR servers, since the servers need continuous mentoring and well configuring against cyber-attacks and malicious programs [7, 8].

5. CONFIGURING HR ROUTERS FROM ATTACKING

The router sends information over client's computers and to avoid unauthorized from exterior. In this case, keep in mind to continuously alter the router's password, where most of the default password can be looked online effectively. Software engineers have to configure in the best way to forbid it from unprivileged access. In this manner, when somebody gets your IP address, it is adequate to put this IP address within the browser to open the router login page. Software engineer must upgrade the router to cancel the choice of outside demands to inside it. A router that's more often than not given by the internet benefit supplier, it is fundamentally a computer pays consideration to the method of directing the internet activity between client computers (or mobile) and the internet association given by the benefit supplier [10].

The router makes a little arrange that interfaces all associated devices. A progressed firewall is introduced on the server and set up. All unused ports are closed to extend assurance, TCP / IP layers are secured, the Internet Control Message Protocol ICMP is set to avoid denial-of-service DoS assaults, and an assault locator is introduced that can distinguish and distinguish assaults straight forwardly against the server. Security against spam and viruses installed discovered by software engineers and arrange channels to anticipate server-generated spam from over conventions planned to extend the quality and availability of channels to do their part. making the servers safe is need a huge number of assault methods.

Software engineer's suppliers frequently attempt to arrange the routers to set up the domestic arrange within the good way, in arrange to urge the association as



before long as conceivable. They don't set all the settings, particularly the security settings, in spite of the fact that they secure the foremost important router settings. Continuously to enter their systems particularly remote. In expansion, the router's errand isn't as it were to secure internet network, but to the computer and all the records in it. That's why it exhorts clients as they arrange the routers to the user's direct that comes with it and alter the settings in a way that increments security as much as possible [12]. Since there's no single component for arranging settings for all routers at once, most routers regularly come with a simple user interface that's accessed via a covered up address through an online browser, this is normal configuration concern to software engineers.

6. PROTECTING AND CONFIGURING HR FIREWALL

A firewall is a program that ensures PC when it is connected with internet. The firewall checks all data and information from the internet, or from some other system, and after that let it go through and get to the PC, and software engineer's task is to manage and configure firewall, compatible with firewall settings, or expels and expels them from malware, such as infections, spyware, or in the event that they are contrary with firewall settings depends on the accurate and experience of the software engineer, a firewall is a limit between a PC and the internet [13]. The firewall is a standout amongst the most critical advances that must be taken to guarantee the PC from software engineers "programmers" and malignant programming. Internet is acknowledged to be hazardous, and it is possessed of security perils. The customer of this system must take care concerning the security of his PC in the meantime as associated with the internet.

A firewall will be introduced first on the server then will be set up. Every sit without moving port are shut to expand security, TCP/IP layers then ICMP will be ensured, after that an assault identifier will be presented, which distinguish and perceive assaults instantly against the server, where manage it before gets more deplorable by interfering with any association via the assailant with the server. Insurance against spam, infections Install and arrange channels to keep server-produced spam from more than conventions laid out to build the quality and availability of channels to do their part as software engineer's task [14]. HTTP insurance from software

engineer's programmers installing application indicator on the work server, which will build the security on the server, and shield the product from assaults, regardless whether known or obscure assaults, will make the server invulnerable to an extensive number of assault techniques.

7. SOFTWARE ENGINEERS ROLE IN PROTECTING AND SECURING HR DATABASES

Software engineer is responsible for planning, usage, supporting and repairing an association's databases organizer or database developer, which is identified as database experts, software engineers "program developers" to protect and develop it in a professional, engineered and frameworks overseer. Software engineer works incorporates improvement and outline of database methodologies, checking and advancement of database execution and limit, arranging of future extension necessities. Software engineers can likewise plan, arrange and keep up security guidelines to ensure databases. The software engineer's process can be seen from more points and along these lines there is in excess of one sort for this procedure [15]. With more logical things such as database design, code writing to manipulate data within the database, software engineer will optimize performance, and keep communicating with programmers to select the best features of a database management system:

- Working on securing the database and implementing solutions to fill the security holes.
- Install and upgrade your database server and software tools.
- Customizing and assign memory to database server and future planning for any expansion need.
- Modifying the database structure.
- Ensuring compliance with the database license agreement.
- Controlling users and monitor their connection to the database.
- Monitoring and improving database performance.
- Backup and restore data or database files especially in backend of the database.



- Writing advances query and create reports from the database.
- Moving data from one database to another, or move the database from one platform to another [16].

8. MONITORING THE INFRASTRUCTURE OF HR INFORMATION TECHNOLOGY

Software engineers are familiar with infrastructure of information technology in organizations and companies, that's why software engineers have take care after information technology infrastructure policy and have known IT foundation as a set of instruments and capabilities that are more often not facilitated by a centralized data organization. For more illustrations and details the communications organize worked by a specific institution and shared by numerous commercial and benefit organizations constitute a common foundation. Laws and traditions are instruments that are interface the abuse of both physical and computing devices to the structure of data innovation. The common offices of the IT design are the exemplification of the built in application and down to applications [17]. It deals to the laws and traditions units of the informatics.

- To discover consistency and agreement within the exercises and behavior related with these activities.
- Establishing an organizational schedule to achieve the assignments in a specific field.
- Deciding decentralized choices in financial exercises in line with the common goals of the state.

The rules of data foundation will direct how assets will be procured, overseen, or abused. For illustration, the strategy of computer program advancement in an endeavor is the premise utilized to mix the abilities of human creatures that are utilized to construct program [18]. Working bunches may improve program via rules management is going utilizing the certain physical properties such as programming languages such as (c ++, Java, etc.). IT measures give directions for making instant decisions that are utilize mental potential in program advancement, as well as utilize particular physical capabilities (programming languages) within the prepare of program improvement [17, 18].

9. CONCLUSIONS

In this paper the role of software engineer's is explained through HR department. Because HR department is one of the most important and sensitive departments in any organization or company, all critical data and information saves there. As well as in this paper all aspects of protecting HR data and the ways protection are discussed, whom been taken care by software engineers. Monumental information about employee salaries, budget of the company, margin profits, revenues, reports, personal data of employees and other important information that is highly sensitive are kept by HR department, so they are required to be in safe hands. In this paper, numerous solutions have been demonstrated and covered in order to keep the HR data away from leakage, either through hacking such as cyber-attacks or manually by an individual or employee. Software engineers can strongly prevent any leakage of data by using their tools and techniques to keep HR data away from vulnerabilities or individual threats and all the methods and procedures are discussed.

Sensitive data management in 21st century is recognized for its data upheaval, technical innovation and transmission of such data through Human Resource Information System is really sensitive and confidential. Software engineers have several techniques in addition to technical background against threats and hackers that can protect HR data in the best way. Unfortunately, still there is a mentality, which some companies think that it's not necessary to hire software engineers in HR department, they don't consider that human resources information system is one of most the critical and important functional department in the organization, as well as the most sensitive and confidential data is being saved there.

REFERENCES

- [1] Davarpanah, A., & Mohamed, N. (2013, November). Human resource information systems (HRIS) success factors in a public higher education institution context. In Research and Innovation in Information Systems (ICRIIS), 2013 International Conference on (pp. 79-84). IEEE.
- [2] Shi, W., Fryman, J. B., Gu, G., Lee, H. H., Zhang, Y., & Yang, J. (2006, February). InfoShield: A security architecture for protecting information usage in memory. In High-Performance Computer Architecture, 2006. The Twelfth International Symposium on (pp. 222-231). IEEE.



- [3] Tian, J., & Xie, Y. (2017, April). Research on the architecture and strategies of yunnan rural human resources smart development in the era of big data. In Information Management (ICIM), 2017 3rd International Conference on (pp. 383-387). IEEE.
- [4] Zhang, H., & Twidale, M. (2012). Mine, yours and ours: Using shared folders in personal information management. Personal Information Management (PIM).
- [5] Courts, H. R., Dholakia, N. K., Dunn, C. L., Huddleston, B. J., Huddleston, E. L., Macartney-Filgate, B. C., ... & Poorte, J. P. (2000). U.S. Patent No. 6,085,220. Washington, DC: U.S. Patent and Trademark Office.
- [6] Abadiano, M. N. (2012). Human Resources Information System for the University of Cebu. IAMURE International Journal of Business and Management, 3, 190.
- [7] Chowdhury, M., Rahman, A., & Islam, R. (2017, June). Protecting data from malware threats using machine learning technique. In Industrial Electronics and Applications (ICIEA), 2017 12th IEEE Conference on (pp. 1691-1694). IEEE.
- [8] Chen, W., Yao, J. and Tan, J., 2018, January. The Design and Implementation of the Honeypot System Based on Spark. In Intelligent Transportation, Big Data & Smart City (ICITBS), 2018 International Conference on (pp. 545-548). IEEE.
- [9] Sun, J., Sun, K., & Li, Q. (2017, October). CyberMoat: Camouflaging critical server infrastructures with large scale decoy farms. In Communications and Network Security (CNS), 2017 IEEE Conference on (pp. 1-9). IEEE.
- [10] Gao, M., Zhu, X., & Su, Y. (2015, November). Protecting router cache privacy in named data networking. In Communications in China (ICCC), 2015 IEEE/CIC International Conference on (pp. 1-5). IEEE.
- [11] Tan, S., Li, X., & Dong, Q. (2016). TrustR: An integrated router security framework for protecting computer networks. IEEE Communications Letters, 20(2), 376-379.
- [12] Domzal, J., Dudek, J., Jurkiewicz, P., & Wójcik, R. (2014). The cross-protect router: implementation tests and opportunities. IEEE Communications Magazine, 52(9), 115-123.
- [13] Diksha, N., & Shubham, A. (2006, November). A novel self configuring dynamic firewall for load reduction of network administrator. In Communication Technology, 2006. ICCT'06. International Conference on (pp. 1-4). IEEE.
- [14] Folch, M. B., Stiemerling, M., & Brunner, M. (2004, October). SIP policy control for self-configuring modular firewalls. In IP Operations and Management, 2004. Proceedings IEEE Workshop on (pp. 87-93). IEEE.
- [15] Squicciarini, A. C., Paloscia, I., & Bertino, E. (2008, April). Protecting databases from query flood attacks. In Data Engineering, 2008. ICDE 2008. IEEE 24th International Conference on (pp. 1358-1360). IEEE.
- [16] Sallam, A., Bertino, E., Hussain, S. R., Landers, D., Lefler, R. M., & Steiner, D. (2017). DBSAFE—an anomaly detection system to protect databases from exfiltration attempts. IEEE Systems Journal, 11(2), 483-493.
- [17] Agrawal, D., Calo, S., Lee, K. W., & Lobo, J. (2007, May). Issues in designing a policy language for distributed management of it infrastructures. In Integrated Network Management, 2007. IM'07. 10th IFIP/IEEE International Symposium on (pp. 30-39). IEEE.
- [18] Dorogy, Y. (2018, February). Meta model of compensatory-decompensational approach for architecture of critical it infrastructure designing. In Advanced Trends in Radioelectronics, Telecommunications and Computer Engineering (TCSET), 2018 14th International Conference on (pp. 223-228). IEEE.



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