CS4404 Learning Journal

You are a cloud security expert who has been hired by a company that is preparing to migrate its operations to the cloud. The company's management is concerned about the security of their data, especially with the increasing amount of data projected due to the Internet of Things (IoT) and Big Data. During your **security assessment**, you have identified **several virtualization security threats** that **could impact the company's data and operations** if not addressed. As a cloud security expert, you need to choose any one of the following proposed future data storage technologies and explain how it could be a possible solution for the company.

**Proposed Future Storage Technology:**

Option 1: Frozen Data

Option 2: Shingled Magnetic Recording (SMR)

Option 3: DNA Data Storage

Option 4: 5D Optical Data Storage

Option 5: Helium Drives.

**Task**

In this assignment, you will choose one proposed future storage technology and write a brief write-up on how it could be a possible solution for the company. You will **also explain any three virtualization security threats** and suggest **countermeasures** to mitigate the risks associated with each security threat.

Your assignment should have a minimum of 400 words and a maximum of 750 words.

Among all the five future storage technologies, I am personally more interested in the 5D optical data storage.

Unlike the DNA and frozen data technologies which are more linking with the development of biology. The 5D optical data storage is using laser writing of data into the multiple layers on tiny glass discs. According to (*The Future Of Data Storage Technologies - SalvageData*, n.d.), 5D storage can store up to terabytes of data with femtosecond laser writing. The orientation and size of structures might achieve 5 degrees of data stored. The storage relays on physical structure that is thermal stabile unlike DNA or frozen that required specific temperature to store them.

According to (Rashid & Chaturvedi, 2019b), there can be multiple general security threats regarding implementing a virtualization solution.

1. The cost might go high and result in high dependency on specific vendor.
2. It might have security risk especially when using public cloud service(Rashid & Chaturvedi, 2019a).
3. It might be time consuming and requires in-house experts to manage the service.
4. It might create availability and scalability issue.

According to (Chen et al., 2020), some more specific major visualization security concerns can be below:

1. Virtual Machine (VM) Escape Attacks:

Threat: Malicious actors can break out of a virtual machine and access the underlying server or other VMs, leading to unauthorized data access.

Unauthorized access: One major concern is the potential for unauthorized individuals to gain access to sensitive or confidential visualizations, which could compromise the security of the data being visualized.

Countermeasure: Implement strict access controls, regularly update and patch VMs and the hypervisor, use intrusion detection and prevention systems (IDPS) for virtual environments.

2. Insecure VM Sprawl:

Threat: Uncontrolled creation of VMs leads to security vulnerabilities and resource wastage.

Countermeasure: Enforce policies for VM creation and management, conduct regular audits to identify and decommission unused VMs, and use automation tools for VM lifecycle management.

3. Hypervisor Vulnerabilities:

Threat: Exploitable vulnerabilities in the hypervisor can compromise the security of all VMs on a server.

Data breaches: Visualizations often rely on large volumes of data, and if this data is not properly secured, it could be vulnerable to breaches. This could result in the exposure of sensitive information and the compromise of privacy

Countermeasure: Regularly update and patch the hypervisor, implement strong access controls and network segmentation, use secure boot mechanisms, and conduct security assessments and penetration testing.

Reference

Chen, L., Xian, M., Liu, J., & Wang, H. (2020). Research on Virtualization Security in Cloud Computing. *IOP Conference Series: Materials Science and Engineering*, *806*(1), 012027. https://doi.org/10.1088/1757-899X/806/1/012027

Rashid, A., & Chaturvedi, A. (2019a). Cloud computing characteristics and services: a brief review. *International Journal of Computer Sciences and Engineering*, *7*(2), 421–426.

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*The Future Of Data Storage Technologies - SalvageData*. (n.d.). Retrieved December 23, 2023, from https://www.salvagedata.com/future-of-data-storage-technologies/