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A DETAILED LOOK AT CURRENT AND POTENTIAL OPPORTUNITIES IN CLOUD AUTOMATION

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Abstract:

Automation has been speculated about and applied over the past few decades in many fields. A study of past applications has proved that the emergence of new technologies has a kinship to automation. One of the new technologies touched by automation is cloud computing. In cloud computing, automation focuses to make all cloud-related tasks as quick, efficient, and as fewer HCI[human-computer interaction] as possible through the use of various software automation tools which are installed directly on the virtualization platform or software and controlled via an intuitive GUI. Cloud automation is a fundamental building block for the cloud computing paradigm. In most industrial industries, automation is the main force of transition. By 2030, the automation industry is expected to completely replace over 800 million workers and technology transforms our way of working and organizing and communicating with others. The almost constant occurrence of data breaches suggests that it does not stop so that organizations are unable to have long-term reservations regarding security automation concepts and capabilities. Businesses across all industry verticals have been leveraging the cloud's efficiency, elasticity, and innovation. However, according to a recent survey, only 35% of organizations have fully achieved their expected outcomes from the cloud, and 65% identified security and compliance risks' as a significant barrier.Though the cloud provides new opportunities for transformation, modernization, and innovation, security risk remains the most significant barrier to cloud adoption. Furthermore, the complexity of hybrid and multi-cloud environments complicates the journey to the cloud.While security is frequently viewed as the greatest impediment to cloud adoption, in reality, it can be its greatest enabler if automated.By automating the cloud security process, organizations can gather the information they need to secure their cloud environments and redirect their efforts.

Keywords: *Cloud Computing, Automation, Cloud Automation, HCI, Autonomic Computing.*

Introduction:

Cloud- Cloud computing is a ubiquitous model for accessing computing resources over the internet. As per National Institute of Standards and Technology [NIST], "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

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(Peter Mell & Timothy Grance, 2011). Analyzing the history of existing technologies it can be seen that cloud computing has emerged from 4 major technologies namely internet technologies like Web 2.0, web services, virtualization.

Automation- Automation is a technique of making processes function with minimal or no human interaction at all. Automation can be applied in various procedures such as monitoring services, production of services, delivery of the same etc. There are 3 types of automation which are fixed, flexible and programmable. Use of the 3 automations depends upon different scenarios as portrayed in fig 1.2.

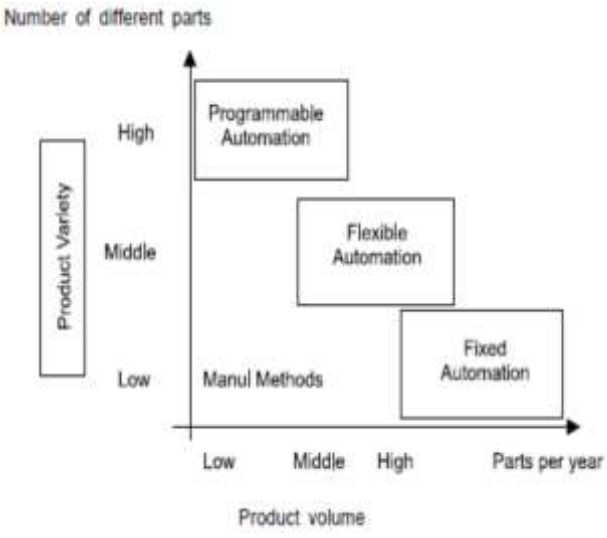

Fig 1.2: Usecase of the 3 types of automation as per annual product production and variety [https://www.controlfreaksltd.co.uk/different-types-of-automation/---]

Automation in the cloud-

"Cloud automation is a software solution which enables the developers and the IT team to install, configure and manage the cloud computing services. Thus, allows businesses to choose the right amount of resources required for cloud computing "(Varsha C L & Dr. Ashok Kumar A R , May-2020). The process of acquiring and releasing of cloud resources like server, storage which are connected over the network without manual interaction is known as cloud automation.

Cloud automation consists mostly of software tools that interact with hardware resources. The software layer fulfills the function of implementing policies to allocate and balance workloads, sustain activities, and determine which compute nodes to use based on what hardware is available.

Review of Literature:

Peter Mell & Timothy Grance, 2011- This paper explains how NIST cloud computing reference architecture focuses on the specifications of "what" cloud services not a "how to" design solution and implementation. The reference architecture is meant to make it easier to comprehend how cloud computing works. It doesn't represent the system architecture of a specific cloud computing system; rather, it is a tool for documenting, discussing, and and creating a system-specific architecture utilising a standard frame of reference.

Varsha C L & Dr. Ashok Kumar A R , May-2020- The features and architecture for each of the systems discussed in this paper. Additionally defining the significance of the same is cloud automation tool. Construction of infrastructure will be place in each of these areas in the future and deploy them, using the technique discussed. Examine the system's deployment's performance, dependability, and scalability.

Opportunities / Benefits of Automation:

As a result of Industry 4.0, automation is now present in cyber-physical systems. For the millennial generation, newer chances for employing intellectual talents for smart systems, smart cities, use of renewable energy, emphasis on green processes to have environmentally friendly systems and processes, effective exploitation of information and communication technology, networking technologies, web-based services, microprocessor controls, and so on have evolved.

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In the end, this comes down to developing a prospective pool of skilled, adaptable people resources in STEM who can retrain themselves in response to new opportunities. Because the installation of automation and its refinement unavoidably necessitates the use of competent individuals, it is the reskilling of workers to upgrade themselves in order to contribute to the altered automated environment. For instance, efforts to automate processes are creating more job opportunities in fields including cyber security, robotics, mechatronics, digital manufacturing, 3-D printing, data science, blockchain technology, web-based applications, real-time control and monitoring, and robotics and mechatronics.

In order to sustain and carry technical support for increased productivity, ease of living, human comfort, longevity, good health, equitable society, and wealth, younger minds must be connected to the digital economy.

Challenges in Automation:

The collective effort to get things done using machines and their automated systems is culminating in intelligent digital systems capable of remaining productive in the absence of human intervention. The incorporation of artificial intelligence into digital manufacturing systems results in the obvious replacement of many people. The impact of such transformations on job loss is most visible on the shop floor. In many industries, robots are replacing humans in certain tasks.

Automation, for example, in the food industry, agriculture, construction, and health sectors for operating healthcare machines, medical robots, multipurpose robots, autonomous vehicles, unmanned operations, and so on, is gradually reducing the need for human labour. To elaborate further, consider how technological advancements have paved the way for mechanised preparation of ingredients for cooking, recipe-based automatic cooking, machines for cleaning utensils, robots for lifting and placing items, services such as waiters, and so on. Why are doctors needed to diagnose disease and prescribe treatment when an interactive software application can perform a similar symptom-based diagnosis? Hospitals rely heavily on technology to provide health services. The use of washing machines, mopping machines, cleaning machines, surveillance systems, and so on has undoubtedly simplified life and reduced reliance on domestic help. The entire agriculture value chain and agriculture business are changing on the basis of low labour input and high yield using technological support. The new norm of online/blended teaching and self-directed learning in the education sector is expected to result in massive job losses around the world. These are a few examples of how to perceive the resulting challenges from ongoing automation.

In the context of India, which has a demographic dividend and a large young population, reports indicating a 69% job loss due to automation are unsettling for policymakers. Labor demand for medium-skill occupations is declining, and there is an imbalance in demand for low and high-skill occupations, which is exacerbating wage disparities. This is concerning for countries with a large population seeking work. The situation is equally distressing in developed economies such as China, the United States, Japan, and South Korea.

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Objective of Study

- To analyze the importance of automation in cloud computing.
- To explore potential areas that can be transformed with cloud automation.

Research Methodology:

- This research paper is based on secondary data obtained from sources like research papers,blogs and websites.
- This paper takes into consideration the observations, findings of research papers 'The NIST Definition of Cloud Computing' published in NIST and 'Review on Cloud Automation Tools' published in IJERT.
- Apart from that this paper also relies on observations from the blog published by International Society of Automation.

Opportunities / Benefits of Automation:

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In the end, this comes down to developing a prospective pool of skilled, adaptable people resources in STEM who can retrain themselves in response to new opportunities. For instance, efforts to automate processes are creating more job opportunities in fields including cyber security, robotics, mechatronics, digital manufacturing, 3-D printing, data science, blockchain technology, web-based applications, real-time control and monitoring, and robotics and mechatronics.

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Challenges in Automation:

The collective effort to get things done using machines and their automated systems is culminating in intelligent digital systems capable of remaining productive in the absence of human intervention. In many industries, robots are replacing humans in certain tasks. Automation, for example, in the food industry, agriculture, construction, and health sectors for operating healthcare machines, medical robots, multipurpose robots, autonomous vehicles, unmanned operations, and so on, is gradually reducing the need for human labor. To elaborate further, consider how technological advancements have paved the way for mechanized preparation of ingredients for cooking, recipe-based automatic cooking, machines for cleaning utensils, robots for lifting and placing items, services such as waiters, and so on. The use of washing machines, mopping machines, cleaning machines, surveillance systems, and so on has undoubtedly simplified life and reduced reliance on domestic help.

These are a few examples of how to perceive the resulting challenges from ongoing automation. In the context of India, which has a demographic dividend and a large young population, reports indicating a 69% job loss due to automation are unsettling for policymakers.

Findings:

Your cloud capacity will always scale to meet all operational requirements. As a result, monitoring the workflow of all tasks in your cloud is critical. This allows you to gain an understanding of how each workflow is carried out.

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The first critical step in automating cloud security is identifying and prioritising the tasks to automate. Closely monitoring workflows aids in evaluating tasks that should be automated, such as repetitive tasks, deployments, resource provisioning, and creating security rules.

Perform an in-depth analysis of the collected data and categorise it as low, medium, or high risk. Then, automate low-risk processes first, followed by medium and high-risk processes. The detailed analysis also allows you to perform controlled automation and study the impact on infrastructure.

- **Misconfiguration**

Misconfigurations of cloud security settings are a leading cause of cloud data breaches. Many organizations' cloud security posture management strategies are inadequate for protecting their cloud-based infrastructure.

Several factors contribute to this. Cloud infrastructure is designed to be easily usable and to enable easy data sharing, making it difficult for organizations to ensure that data is only accessible to authorized parties. Also, organizations using cloud-based infrastructure also do not have complete visibility and control over their infrastructure, meaning that they need to rely upon security controls provided by their cloud service provider (CSP) to configure and secure their cloud deployments. Since many organizations are unfamiliar with securing cloud infrastructure and often have multi-cloud deployments – each with a different array of vendor-provided security controls – it is easy for a misconfiguration or security oversight to leave an organization's cloud-based resources exposed to attackers.

- **Unauthorized Access**

Unlike an organization's on-premises infrastructure, their cloud-based deployments are outside the network perimeter and directly accessible from the public Internet. While this is an asset for the accessibility of this infrastructure to employees and customers, it also makes it easier for an attacker to gain unauthorized access to an organization's cloud-based resources. Improperly-configured security or compromised credentials can enable an attacker to gain direct access, potentially without an organization's knowledge.

Suggestions:

How can Misconfiguration be solved?

1) Build Infrastructure Automation

Engineers are relieved of the burden of manually configuring security groups, networks, user access, firewalls, DNS names, and log shipping by automating infrastructure buildout. This drastically reduces the possibility of engineers making security mistakes.Further more, the security team does not have to worry about best practises every time they spin up a new instance because the changes are made to the scripts rather than the instances.

2) Create an automated script

A zero-day vulnerability or any other major security issue in traditional IT necessitates an organization's system engineers working tirelessly to manually patch every server. However, automating scripts only necessitates a single line change in the manifests to ensure that the newly released version is used instead.These automation script resources are declarative management tools that configure instances, virtualized servers, and bare metal servers automatically.When a new instance is launched, these scripts prepare it for production by performing security configuration tasks such as ensuring central authentication, installing intrusion detection agents, and enabling multi-factor authentication.

3) Make Deployments Automated

While automating deployments is one of the best DevOps practises, it can also improve an organization's security posture. In the event of a zero-day vulnerability, deployment automation ensures that changes to the DevOps tool script are automatically deployed across all instances or servers.

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4) Make security monitoring more automated.

Identifying and resolving a security breach and downtime can be resource-intensive and time-consuming.

Engineers can respond to the attack and protect critical assets with the help of automated security monitoring.

How to solve Unauthorized Access?

Wireless security revolves around the concept of securing the wireless network from malicious attempts and unauthorized access.Monitor for suspicious account activity such as privilege escalation and multiple account creations. Monitor for these activities using Cloud Audit Logs and Event Threat Detection. Identity and Access Management- Audit IAM users and their policies frequently.

Conclusion:

It is on the verge of transition as a result of ongoing discussions and worries about Industry 4.0's push for employment losses. The expected success of cyber-physical systems to improve living standards is hampered by the loss of jobs and poverty in several facets of society. Therefore, automation cannot be done in a vacuum; it requires practise and redesign to continue working in the presence of human intervention.

Even if unmanned system operation is now a reality, society as a whole would be severely affected by it. It is inevitable that the link between humans and machines must be strengthened in order to achieve sustainable development in the future. This is the method for transferring Industry 4.0 to Industry 5.0, i.e. The fifth industrial revolution is ushered in by the fourth one.

The use of both human beings and robotics and automated machines is necessary today. The future consequences of skewed high-skill personnel development for specific industries could be catastrophic. As a result of the need for input from all spheres of life in order for cyber-physical systems to have a long-term meaningful presence and impact on society, the educational system must prioritise the nearly balanced growth of all educational disciplines.

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