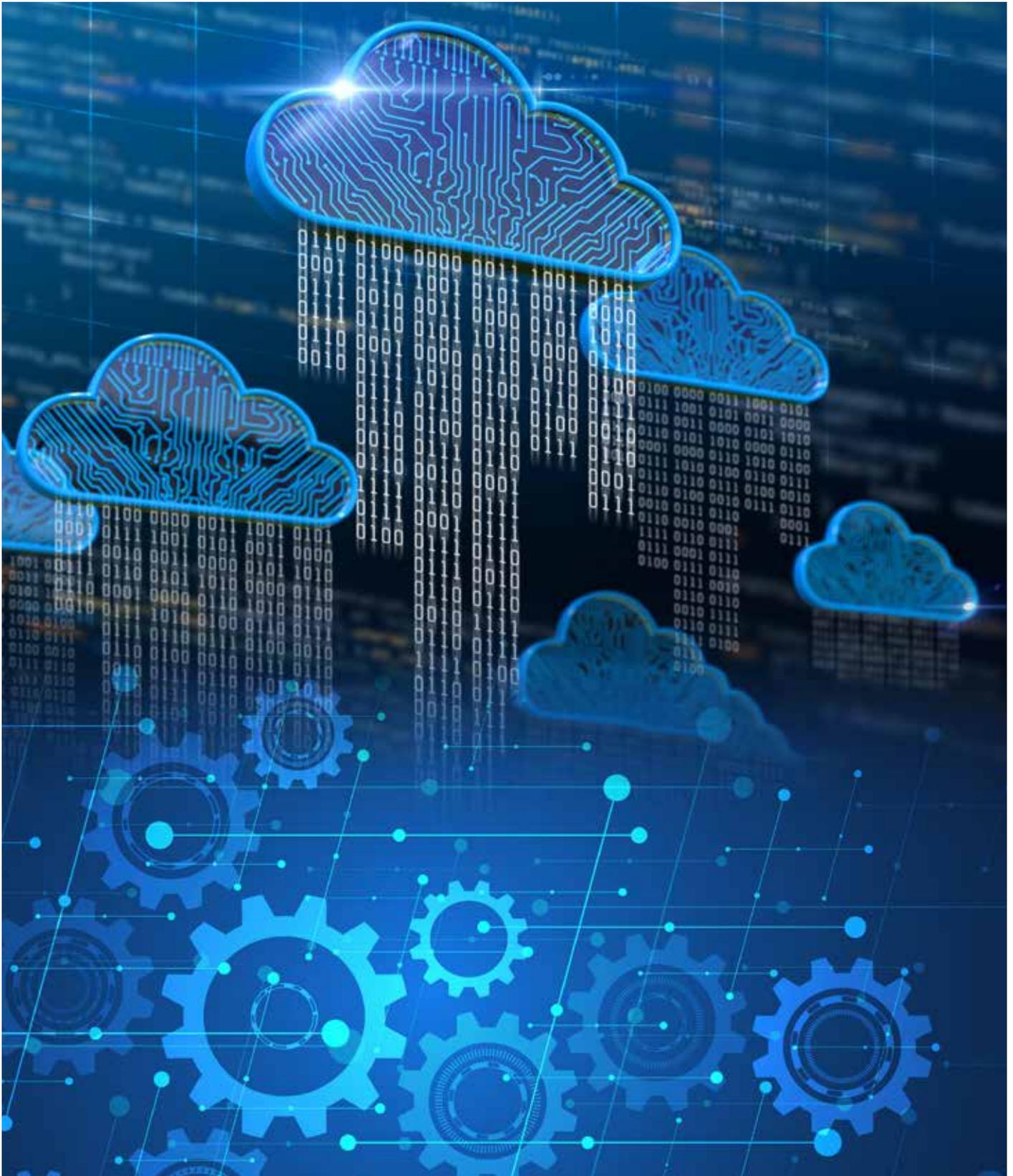# Automation Using Cloud-native Services

Whitepaper by Vinod Kumar Mohan, Automation Consultant, Senior Manager |
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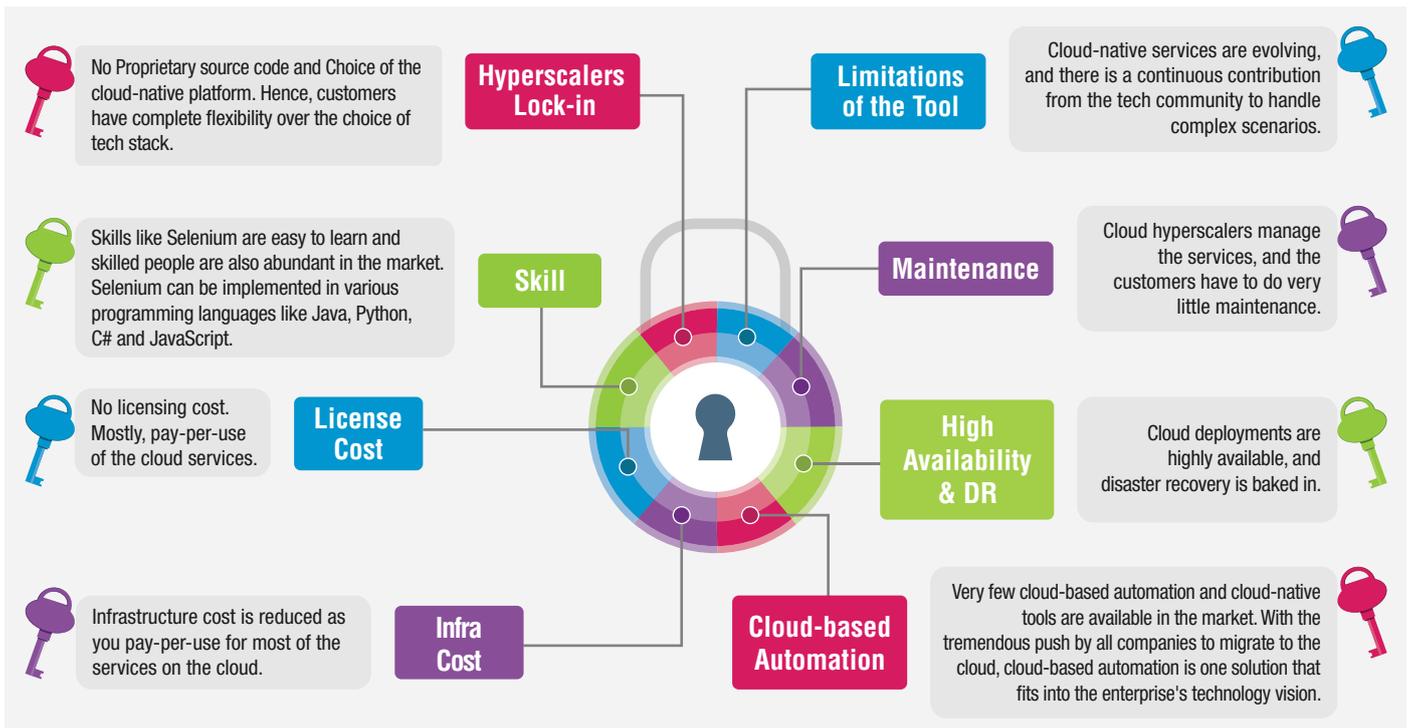
Contents

1.
Introduction

Today, most business wants to be tech-intensive to stay ahead of the curve and be future-ready. In this expedition, enterprises are accelerating cloud transformation to drive value for the company and bring in scalability, affordability and optimized pricing models for their day-to-day operations. However, conventionally Process Automation was not built into the cloud; it requires expertise and specialized tools. While few cloud-enabled automation platforms are readily available in the market, they are expensive. Hence, it would be cost-effective and scalable to build the automation framework using cloud-native services to automate the business processes for the future.

Mphasis has deep expertise in Process Automation and Transformation, leveraging multiple technologies across RPA, intelligent data extraction, AI/ML algorithms and cloud-native platforms. This experience helps to enable business process automation to bring down the automation cost and help ease development and maintenance for the automation developers.

2.
Cloud-native Service-based Automation

Some advantages of moving to cloud-native services are stability, reliability and highly available applications. However, despite these advantages, organizations face challenges while adopting cloud-native technologies.

Here is the list of challenges that corporates face with the current set of automation platforms and how these challenges can be mitigated with the cloud-native automation approach.

No Proprietary source code and Choice of the cloud-native platform. Hence, customers have complete flexibility over the choice of tech stack.

Hyperscalers Lock-in

Limitations of the Tool

Cloud-native services are evolving, and there is a continuous contribution from the tech community to handle complex scenarios.

Skills like Selenium are easy to learn and skilled people are also abundant in the market. Selenium can be implemented in various programming languages like Java, Python, C# and JavaScript.

Skill

Maintenance

Cloud hyperscalers manage the services, and the customers have to do very little maintenance.

No licensing cost. Mostly, pay-per-use of the cloud services.

License Cost

High Availability & DR

Cloud deployments are highly available, and disaster recovery is baked in.

Infrastructure cost is reduced as you pay-per-use for most of the services on the cloud.

Infra Cost

Cloud-based Automation

Very few cloud-based automation and cloud-native tools are available in the market. With the tremendous push by all companies to migrate to the cloud, cloud-based automation is one solution that fits into the enterprise's technology vision.

3.
How to Automate Business Processes with Cloud-native Services?

Mphasis works with multiple automation platform providers, has partnerships, an expert team and a proven record of delivering significant value to customers.

Any typical automation platform needs to have these components to develop, test and deploy the bots:

✓ Studio to build automation code

✓ Packaging and deployment architecture

✓ Execution framework for the bots

✓ Orchestration framework

✓ A control tower to manage the tasks

✓ Password management

✓ Datastores

✓ OCR and Human in Loop capabilities

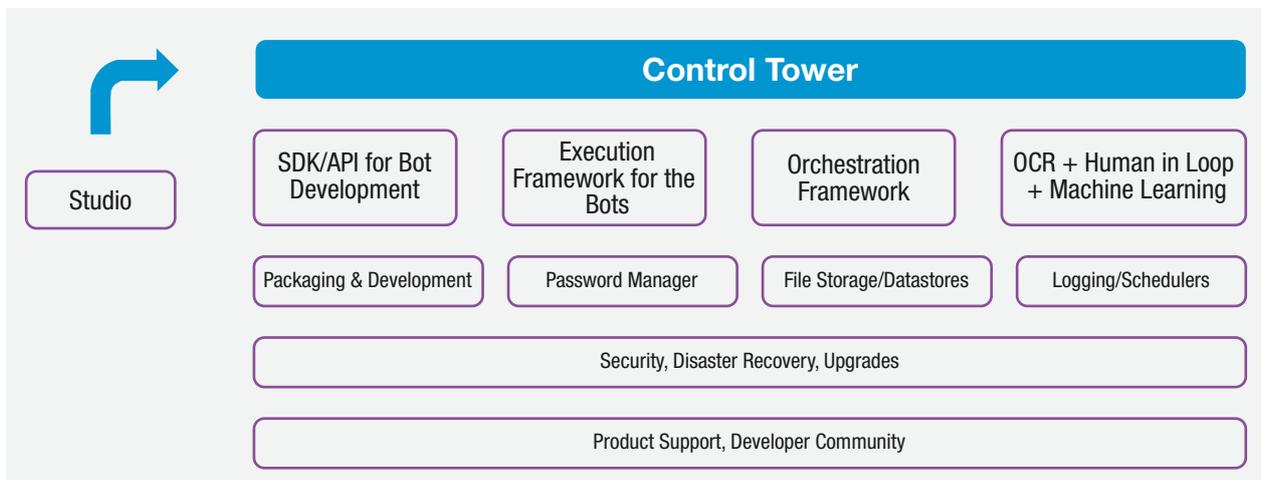✓ Machine Learning capabilities

✓ Logging/schedulers

Figure 1: Typical offerings of an automation platform provider

Cloud hyperscalers offer reliable, scalable and inexpensive cloud computing services. In addition, they provide various services that are not limited to Compute, Networking, Storage, Database, Analytics, Messaging, etc. This gives us the flexibility to put together services that can help build a full-fledged automation platform.

The table below illustrates how to map the capabilities of an automation tool to cloud services. Here, we have shown examples of Azure and AWS. This could be achieved with other cloud hyperscalers too.

Components	Azure	AWS
Studio	PyCharm, Microsoft Visual Studio, IntelliJ IDEA, NetBeans, Eclipse, AWS Cloud9 (Cloud-based IDE), Microsoft Visual Studio Online (Cloud-based IDE)	
SDK/API	Selenium code using Java/Python/C#, JavaScript	Selenium code using Java/Python/C#, JavaScript
Execution Framework for the Bots	Azure Functions, Container Instances, Azure Kubernetes Service, VM's	Lambda, Elastic Cluster Service, Elastic Kubernetes Service, VM's
Orchestration	Logic Apps, Azure Event Grid	Event Bridge, Step Functions
OCR	Azure Form Recognizer	Textract, Rekognition
HIL	Content Moderator (Microsoft Cognitive Services), Custom UI	Amazon Augmented AI
Machine Learning/Artificial Intelligence	Microsoft Cognitive Services	Machine Learning Services (SageMaker)
Packaging & Deployment	Azure DevOps or any other combination of ci-cd services. Cloud infrastructure can be provisioned using Azure Resource Manager code templates and plugged into the DevOps pipelines.	AWS Code Build or any other combination of ci-cd services. Cloud Infrastructure can be provisioned using code templates using AWS CloudFormation (& SAM) and plugged into the DevOps pipelines.
Password Manager, File Storage, Datastores, Logging, Scheduler	Standard services across cloud hyperscalers	
Security, Disaster Recovery, Upgrades	All managed resources from the cloud hyperscalers ensure that these horizontals are handled well	
Product Support/ Developer Community	Cloud hyperscalers maintain the managed resources Developer Community – Selenium has been a tool of choice for test automation for a long time and has a large developer base	

Cloud-native landscape is vast, and it is easy to get lost in its expanding number of competing and overlapping platforms and technology options. We help organizations transform their environment by adopting cloud computing services and leveraging Artificial Intelligence (AI) & Machine Learning (ML) powered apps in automation.

Automation scope is broadened, and efficiency increased with the inclusion of AI & ML. It is an added layer of automation that brings human cognition into workflows. Our expertise and market-ready products in AI & ML help us make automation more efficient.
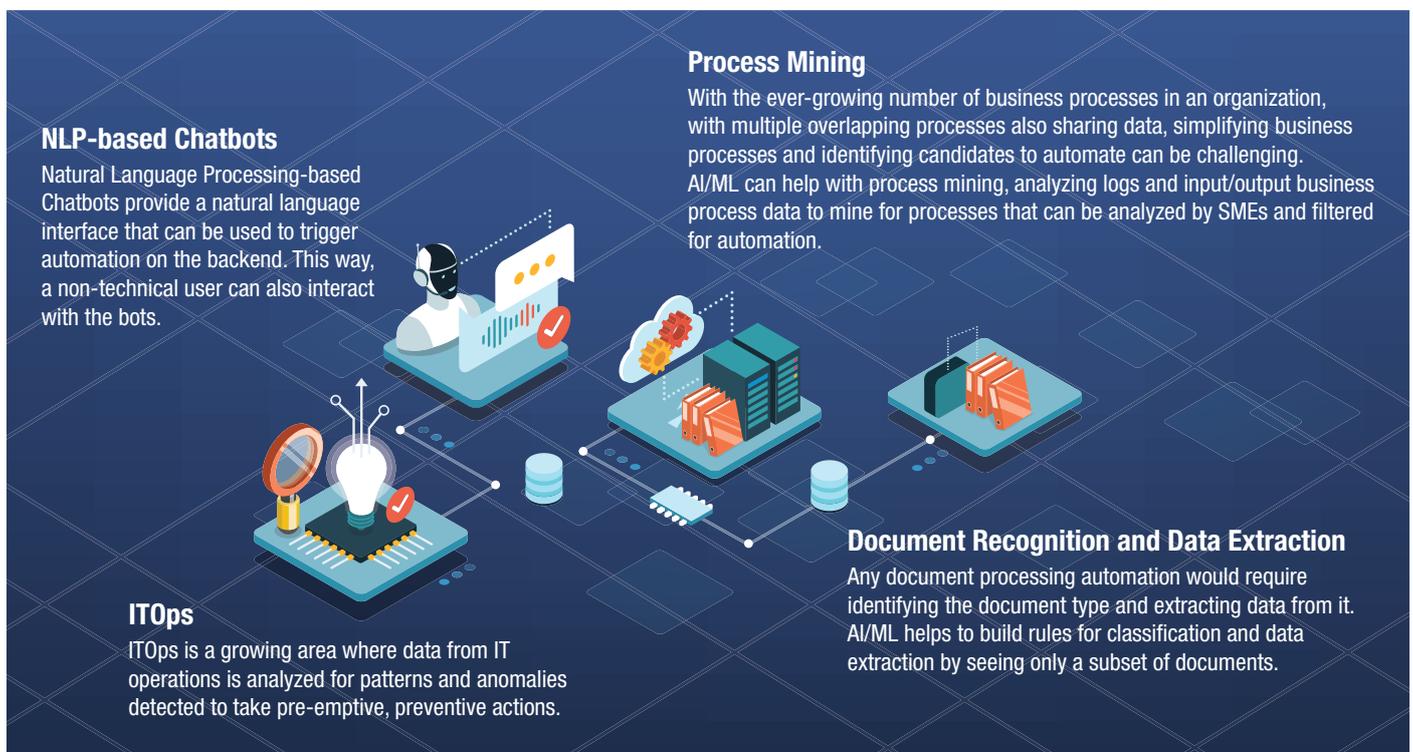
4.
AI & ML – Artificial Intelligence and Machine Learning in Automation

AI & ML can enhance the efficiency of automation and expand its possibilities. Cloud, with its on-demand, highly scalable and high-performance computing capabilities, serves well for building AI/ML models requiring intensive computing.

Cloud hyperscalers offer managed services that are purpose-built for use cases like Natural Language Processing, Text Extraction from images, Document Classification, etc. They are built using high-end AI/ML models and data that provide highly accurate results.

Some of the applications of AI & ML in automation are:

Process Mining
With the ever-growing number of business processes in an organization, with multiple overlapping processes also sharing data, simplifying business processes and identifying candidates to automate can be challenging. AI/ML can help with process mining, analyzing logs and input/output business process data to mine for processes that can be analyzed by SMEs and filtered for automation.

NLP-based Chatbots
Natural Language Processing-based Chatbots provide a natural language interface that can be used to trigger automation on the backend. This way, a non-technical user can also interact with the bots.

Document Recognition and Data Extraction
Any document processing automation would require identifying the document type and extracting data from it. AI/ML helps to build rules for classification and data extraction by seeing only a subset of documents.

ITOps
ITOps is a growing area where data from IT operations is analyzed for patterns and anomalies detected to take pre-emptive, preventive actions.

All the above applications only enhance the overall benefits of automation, making the application of AI/ML to automation a necessity and not an add-on.

5.
IDP – Intelligent Document Processing in Automation

Intelligent Document Processing is a specialized tool driven by Artificial Intelligence/Machine Learning. It helps automate data extraction from complex semi-structured/unstructured documents and convert them into structured, usable data. It is also referred to as Cognitive Data Processing or Intelligent Data Capture.

IDP takes advantage of Artificial Intelligence (AI), Machine Learning (ML), Optical Character Recognition (OCR), Computer Vision and Intelligent Character Recognition (ICR) technologies to classify, categorize, extract relevant data and validate the extracted data for improved accuracy.

Some of the applications of IDP for automation are:

KYC
Know your customer documents data extraction. This is a complex use case in automation, as each country has several templates. In addition, these documents are typically scanned, meaning quality is an issue – making data extraction more difficult.

Accounts Payable
Manual processing of invoices is a tedious, error-prone task. IDP can identify, extract and organize relevant data – freeing up the manual human workforce.

IDP helps with hard-to-automate problems and can be valuable to the automation solution kit.

6.

HIL - Human in Loop in Automation

Despite the advances of AI/ML, there are always scenarios that these technologies cannot handle to the extent desired. In such cases, having a human review can help close the gap. Human reviews can also be included as random QC, increasing the confidence in such solutions.

Human in Loop refers to a data review by human workers, which is part of a workflow. HIL is especially useful for validating and updating data processed by OCR and AI-ML tasks.

Human reviews can be triggered based on:

- Low confidence data extraction scores

- Missing fields information

- Randomly for QC

Business users/SMEs are provided with a UI Template (simple web application) where the data is presented for validation and update if necessary. Authenticated access can be provided to the users using any Open ID connect identity providers.

These reviews can be orchestrated as part of workflows, helping improve automation potential, data quality and QC.

Managed services from the cloud hyperscalers provide Intelligent Data Extraction, AI-ML and HIL platforms which can be brought together within an automation workflow.

7.
Governance and Reporting in Automation

Governance is a critical component to achieving standard outputs with scale in automation. Reporting provides valuable insights into the performance of automation, which is vital in value realization and justification of efforts. Together, they are important pieces of the automation process.

Some of the critical aspects are given below:

Access

There are various users of an automation solution like developers, admins, business users, analytics teams, etc., and each user would require specific access and privileges.

Access to resources and services on the cloud is controlled using Identity and Access Management services provided by all cloud hyperscalers. In addition, Role-Based Access Control (RBAC) and integration on-prem Active Directory (AD) are provided by all platforms. Centralized governance and control can be established.

Security

Security is a core requirement for an automation solution as it deals with sensitive data. Security is two-fold on the cloud. First, cloud hyperscalers ensure the security of the data centers, hardware, system software updates, etc.

The second part of the security responsibility lies with the users to ensure network traffic and firewalls are configured securely. Enforcing encryption of data at flight and rest is also a possibility. Cloud hyperscalers also offer best practices in well-architected framework guides that encompass security, performance, cost-effectiveness, etc.

Cost

Reduced cost as a benefit of automation is one of the core goals. Understanding the various pieces of expenditure is important to know the overall benefit. Cost governance in cloud is achieved with features like creating logical entities like org and associating users with these orgs, budgeting provisions and enforced access controls to limit non-relevant usage. Forecasting and Optimization tools help in better financial management.

Monitoring and Observability

Monitoring automation solutions deployed on the cloud, understanding resource utilization and getting a unified view of the operational health will help keep the solution running in good health. There are various tools in the cloud that allow for monitoring, capturing metrics and taking action, if necessary.

Also, there are alerting services that help to notify the support teams and business users.

Reporting

Reporting is another core part of an automation solution. Business level metrics reporting can be achieved by analyzing transaction level data. Live dashboards with these metrics can offer the business the value achieved out of automation.

Any visualization tool can be connected to the databases on the cloud to create dashboards and reports.

8.
Why is Process Automation with Cloud-native Services Futuristic?

The ever-growing need for digitization has put automation on the fast track, and the need to see higher ROI is a constant push to innovate. We see that automation tools combine many modules for which we can find alternatives in the open-source and in the cloud services world.

The explosive growth of the cloud is seen in every industry. Cloud's benefits of scale, cost, availability, security and a widespread community are all compelling. So, it becomes natural to bring innovation in automation by putting together open-source technologies and deploying them on cloud-native infrastructure leveraging the managed services by the cloud hyperscalers.

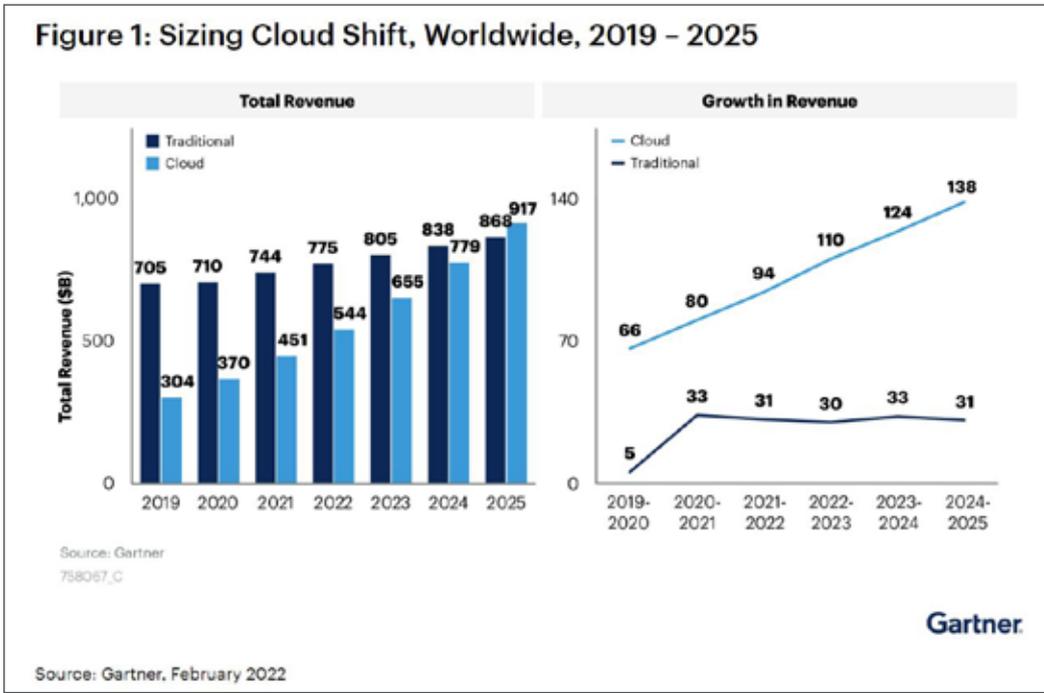**Figure 1: Sizing Cloud Shift, Worldwide, 2019 – 2025**

Figure 1: Traditional vs. cloud expenditure 2019-2025 | Source - Gartner® Press Release, Gartner Says More Than Half of Enterprise IT Spending in Key Market Segments Will Shift to the Cloud by 2025, February 9, 2022. https://www.gartner.com/en/newsroom/press-releases/2022-02-09-gartner-says-more-than-half-of-enterprise-it-spending. GARTNER is a registered trademark and service mark of Gartner, Inc. and/or its affiliates in the U.S. and internationally and is used herein with permission. All rights reserved.

Some of the reasons for the exponential growth of automation in cloud-native services can be attributed to the following:

Serverless Computing

Serverless computing is computing performed on managed infrastructure. It removes the responsibility for back-ends from IT and DevOps teams and enables engineers to focus solely on application or code functionality. As per our experience, serverless computing helps automation benefits in terms of higher ROI due to the reduced effort and cost on infrastructure (no dedicated servers) and gains from the flexibility to rapidly scale up or down based on demand.

Cloud-native Services - Containers

Containers are packaged applications, operating systems and data. The use of containers has been essential to expanding cloud services and is the base on which cloud-native applications are built. Containers give the automation teams the option to pick and choose various combinations of coding languages, dependencies and platforms.

Automation benefits from ease of deployment and delivery of bots with containers.Cloud hyperscalers also offer a serverless option to run containers, thereby giving all benefits of serverless computing.

Cloud Security

Cloud security is a set of policies, technologies and applications to protect cloud computing environments. Major cloud providers have included enterprise-grade security features in their services. We understand that automation requires the highest security as it mainly deals with sensitive confidential data. The cloud hyperscalers provide the physical security of the data centers along with varying levels of authentication and authorization options to ensure the highest level of security. It includes but is not limited to private networks within the cloud (VPC – Virtual Private Cloud), network security, data encryption at rest and in transit, RBAC, resource level access restrictions, etc.

Managed Services

Cloud hyperscalers provide a spectrum of managed services from databases, workflow orchestrators, queues and notification services to monitoring and logging. Automation benefits from these services in integration, workflow, monitoring, etc. These services provide the backbone of the automation solution and offer cost and maintenance advantages, as with the other case in point here.

Growth of Hybrid Cloud

Pairing private, on-premises data centers with public clouds has allowed companies to keep the critical systems/data on-prem and move the rest to the cloud. Hyperscalers provide a private link option to connect VPCs, cloud services and on-premises networks without exposing the traffic to the public internet. Automation benefits significantly with an expanded scope due to the hybrid cloud. Automation solutions running on the cloud can securely process both the on-cloud and on-prem applications.

Shift from Capex to OpEx

Users can now save significant amounts of money on hardware and data centers and instead buy services on an as-needed basis.

Automation ROI increases if spending is limited to the solution and infrastructure is paid per usage. It eases the burden on the infrastructure team, where they are not required to plan and procure hardware ahead of its desired usage period. Cost is also saved on maintenance.

Infrastructure as a Code

Infrastructure as Code (IaC) manages and provides cloud infrastructure through code. Automation benefits from this as all the required infrastructure is provisioned with code, which is versioned and saved on source code repositories, with no support from the IT team while achieving total DevOps. This provides rapid, instant, anytime deployment with no errors or support.

High-Performance Computing (HPC)

All major cloud providers offer HPC instances, which are highly parallelized and offer huge computing capacity at an affordable cost. Automation benefits from HPC systems used for compute-intensive processing and building Artificial Intelligence/Machine Learning models. AI/ML models can be integrated with the automation flows resulting in intelligent automation.

9.
Use Case

A large wealth management firm in the US achieves high efficiency and scalability while reducing costs by automating processes with cloud-native services.

Business Challenge

The client's existing Dormant Account Processing was time-consuming and highly manual. It involved verifying accounts against the mainframe system, validating data against financial intermediary websites, performing a manual QC of the account data with the business SME and then creating accounts in the mainframe system. They aimed to automate their processes to bring efficiency and scalability and free up the key resources to focus on critical work while saving costs.
Types of Automation: Web Automation, API processing.

Solution

To enable bot for the Dormant Account Processing, we used AWS cloud, leveraging open-source libraries and managed cloud-native services. To automate the infrastructure provisioning, we built a DevOps pipeline using SAM templates and Cloud Formation Stacks from AWS. We delivered the following services in an integrated manner:

- The mainframe system operations had a wrapper exposing them as APIs. These APIs allowed the automation bot to perform CRUD operations for each screen in the mainframe system. API processing was done using Java code and deployed on the serverless platform, AWS Lambda.

- Web automation was done using open-source Selenium library containerized using docker and deployed to EKS Fargate (serverless) docker orchestration service. Further, scaling was done based on the volume of the input.

- Utilized managed workflow orchestrators - AWS Step Functions and Event Bus - AWS EventBridge; serverless databases – AWS RDS. Workflow QC was done by the business SME and the handshake between the bot and the SME was done through emails using the AWS SES service.

- Leveraged IAM (Identity and Access Management) policies to configure the least privilege policies for resources and Role-Based Access Control (RBAC) for the users.

- Deployed VPC, subnets and security groups to ensure maximum security for the solution on the cloud.

- Encryption of the data at rest and in flight was done to safeguard data in the database, s3 buckets and while being moved between various services. Leveraged CloudWatch logs, metrics and alarms to help log and monitor the solution.

- Common dependencies were built into a maven project and added as a Lambda layer.

- Spring Cloud was used as the framework to put together the automation code in Java.

Benefits

- Automated 5 FTEs work
- Built on open-source technologies with zero licensing cost
- Eliminated manual work for infra setup
- No upfront capacity provisioning because of managed infrastructure from the cloud hyperscalers
- Enabled role-based access to provide required-only access
- All infrastructure provisioned was pay-per-use
- Always available automation on the cloud, practically zero downtime
- Secured data through encryption
- Constant monitoring and alerting to help support teams

10.

What is the Difference Between Typical RPA Tools vs. Automation Using Cloud?

For automation using the cloud, the following needs to be considered:

Development

Automation is implemented using open-source libraries like Selenium for web automation, Apache POI libraries for excel-based work, etc.

Detailed Design

Design requires understanding the features and limitations of the various services being used. Cloud Resource Access policies are defined at the basic task level like read, create, update, etc., and must be detailed during the design phase. Region-specific restrictions for services, with default quotas, must be understood.

Infrastructure

No planning is necessary for capacity or maintenance with this new approach. Provisioning and basic setup of the new servers are also avoided here.

Infrastructure as Code

Infrastructure is provisioned using configuration templates, unlike RPA tools, where this is manual.

Additional Responsibilities

Although infrastructure is set up as a one-time configuration to be repeatedly used, the responsibility to develop the code to provision them is with the development team.

Scale

Scaling up and down the capacity is an automated task with the cloud.

Documentation

Extensive documentation is available on various cloud services, with details on each feature and examples of how to use them. This aids the design, configuration and development.

Huge Community

The cloud community is vast, and most tech issues that are encountered are highly likely to have been addressed already.

11.

Conclusion

Process automation using the cloud will become the next big thing shortly. We can see from the above that building automation solution on the cloud provides huge cost, effort and scale benefits.

We believe it is a natural step to build your next automation solution open-source and on the cloud. Having gone through the journey of building and delivering on this technology stack is a proof of how production-grade automation solutions can be achieved with this stack. Despite its challenges related to pro-code/intensive coding requirements, the overwhelming benefits of this novel approach make it a compelling option to consider for automation solutions. With the rapid innovation and adoption of the cloud, such an approach makes sense not only for the 'now,' but also for the future.

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About Mphasis

Mphasis' purpose is to be the *"Driver in the Driverless Car"* for Global Enterprises by applying next-generation design, architecture and engineering services, to deliver scalable and sustainable software and technology solutions. Customer centricity is foundational to Mphasis, and is reflected in the Mphasis' Front2Back™ Transformation approach. Front2Back™ uses the exponential power of cloud and cognitive to provide hyper-personalized ($C = X2C_2^2 = 1$) digital experience to clients and their end customers. Mphasis' Service Transformation approach helps 'shrink the core' through the application of digital technologies across legacy environments within an enterprise, enabling businesses to stay ahead in a changing world. Mphasis' core reference architectures and tools, speed and innovation with domain expertise and specialization, combined with an integrated sustainability and purpose-led approach across its operations and solutions are key to building strong relationships with marquee clients. Click here to know more. (BSE: 526299; NSE: MPHASIS)

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