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Ansible: The Automation Tool

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Abstract. Before the arrival of automation tools and techniques IT world has faced a lot of loss in terms of money, time and space and with low quality service. So some of the automation tools were designed which made the work easier and efficient. The task which use to take 17 hours now have reduced to 3 minutes and some seconds which is only possible through these automation tools.
The purpose of this paper is to tell about the importance of automation tools in IT world. In this paper the emphasis will be on various automation tools such as Puppet, Chef, Saltstack and Ansibles and deeply study about Ansibles. This tool gained the boom due to high enterprises adoption such as NASA, FATMAP, NEC, Apple, etc. In this paper, there will be three case studies highlighting the importance of Ansible and its features. It also tells that how Ansibles automates configuration, deployment.

Keywords: *configuration, deployment, orchestration, automation.*

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1 Introduction

Automation has gained a high popularity in recent years. In the absence of automation tools, the IT world has faced the problem of *mass deployment, migrating from test to deployment, application failure.* The solution to these entire problems was a need of tool which can automate the *configuration, application deployment and intra-service orchestration*. Automation tool helps in mass deployment through automation of configuration and deployment which reduces the high risk of human error, and time which were possible if we do it manually. It helps in "Migrating from test to deployment". Earlier due to difference in computing environment certain functions may not work properly when deployed but the automation tool will provide us the consistent environment during software delivery life cycle. Automation tool prevents application failure as when we update some changes and it fails and we want to move back to previous stable stage then this tool is of great help.

In a layman terms, the technique of making an apparatus, a process, or a system operate automatically. Technically, the automation is the creation and application of technology to monitor and control the production and delivery of products and services.[1]

Virtually, the automation helps to all kind of industries. For example *manufacturing*, it includes food, chemical, petroleum and paper, etc; *Transportation,* it includes automotive, aerospace and railway; *defense; security; energy management* and many more. [7]

The features due to which automation tool such as Puppet, Saltstack, Chef and Ansible are on boom are: *scalability* which means that they can handle 50 clients and also 500 clients, *ease of setup*, *availability* which means that they have multi server architect, if one goes down then other can take its place, *management, inter- operability.*

Infrastructure as Code

Infrastructure as Code or IaC is automation of operations i.e. to build, deploy and manage through code rather doing manually. IaC uses higher-level or descriptive language to code for more versatile and adaptive provisioning and deployment processes.[2]

If a person wants to install an 'x' software on 5 nodes, for that purpose we write the code on a central computer which can also be called *control server* to install that software and send the same to those different environments and execute it.

Advantages of IaC:

- It saves the time as we do not need to install manually on each node, we can do it by just writing the configuration on one central location and replicate that on other nodes.
- It prevents application failure, since we have proper record of the system state where we can roll back to previous state after doing some updates that .
- It increases the release frequency.

The use of modern coding systems like Ansible or Puppet is designed to make IaC environments accessible to anyone with basic knowledge of modern coding techniques and structures.[5]

Shell Script & CM Tool Script

Shell script is the script which consists of automation code from start. In this, one have to define proper workflows and it does not provide with any user interface. The person who is good with programming skills can adopt for Shell script.

CM tool script is *configuration management* tool. *Eighty percent* things or modules are already present within the tool which reduces the overhead of code and reduces the risk of errors. Workflows are already defined and user interface is available which makes the job easy. Examples of CM tool script are Puppet, Chef, Saltstack and Ansible.[4]

2 Different Automation Tools

Puppet

Puppet is an automation tool which is designed to manage the configuration of linux- like and Windows systems declaratively and automates the repetitive task. It has master-agent architecture. On the server side we have to install puppet master. And on client side, we have to install puppet agent and then there is a certificate signing between two. Its features are that it is flexible and open source, so custom libraries and modules can be implemented. This tool takes care of hosts throughout the life cycle from start to end. And its important feature is that it reuses the resources across different platforms.[4] [5]

SaltStack

SaltStack is a new approach to infrastructure management built on a dynamic communication bus. Salt can be used for data-driven orchestration, remote execution for any infrastructure, configuration management for any app stack.
It has master- agent architecture. On the server side, we have to install salt master and clients are minions. Its inter-operability is such that salt master works only on Linux/Unix but Minions also works on windows.[4][5]

CHEF

Chef is an automation tool that provides a way to define infrastructure as code. It automates how infrastructure is configured, deployed, and managed across your network, size does not matter. It has master-agent architecture. On the server side, we have to install chef master. And on client side, we have to install chef agent. It has extra component which is workstation. Workstation is a machine which consists of all the configurations and all the configurations are tested over workstation and then they are pushed to central chef master (server side). Chef server works only on Linux/Unix but Chef client and workstation also works on windows.[4][5]

Ansible

Ansible is a very simple IT automation engine that automates configuration, application deployment, intra-service orchestration. Ansible supports Linux/Unix and Windows as well but the Ansible server needs to be on Linux/Unix.

Table 1 Classification of tools on basis of different characteristics.

Features	Puppet	Saltstack	Chef	Ansible
Scalability	highly	highly	highly	highly
Availability	easily	easily	easily	easily
Configuration	pull	push	pull	push
Scripting language	Puppet-DSL	Py. YAML	Ruby-DSL	Py. YAML
Installation	Tedious work	Tedious work	Tedious work	Simple work

Above table tells us about the advantages and disadvantage of different tools. Disadvantages of Puppet are that it uses PuppetDSL to write the configuration which is hard to understand and its installation is a tedious work. The disadvantages of Saltstack are that it uses push configuration to manage the configurations as push configuration requires some command to be executed on the server in order to push those configurations on nodes but in pull configuration there is no such need and its installation is a tedious work. The disadvantages of Chef are that it uses RubyDSL as scripting language which is not very easy to learn and its installation is a tedious work. The disadvantage of Ansible is that it uses push configuration and its great advantage is that its installation is very easy.[4][5][7]

3 Brief about Ansible

Today Ansible is the most used automation tool amongst all other tools which have been discussed above. The reason behind its boom is its easy installation process and also due to the adoption by the big enterprises such as FATMAP, Apple, NASA, Uniper, Grainger, WeightWatchers, SaveMart etc.
The statistics between “November 2012 to November 2017” tells that Ansible is most
promising and widely used tool. Puppet and Chef are the old players but their popularity is just *2%* and *7%*. Whereas Saltstack and Ansible are new players and Ansible has dominated the IT world.[4]
Before the use of Ansibles one must make sure that the client side has SSH Client i.e. open SSH and python package installed. As Ansible communicate over SSH and python package will help in decoding the configuration which is written in python.[5]
Features of this tool are:

- It is an open source tool. This feature adds one more reason to use this tool as it can be installed and used freely by anyone anytime.
- Ansible consist of the modules which are considered as *unit of work*. Each module is standalone and can be

scripted in a standard scripting language such as python. This feature makes Ansible more user friendly and easily manageable tool.

- It has agent less client configuration. It means that no agent is required on the client side and thus reduces the need of space on client side to install Ansible. This feature makes the setup easily installable on the system.

Evolution

The name "Ansible" refers to a fictional instantaneous hyperspace communication system. As featured in Orson Scott Card's Ender's Game (1985), and originally conceived by Ursula K. Le Guin for her novel Rocannon's World (1966)).

Michael DeHaan, the author of the provisioning server application Cobbler and co- author of the Func framework for remote administration, developed the platform It is included as part of the Fedora distribution of Linux, owned by Red Hat Inc., and is also available for Red Hat Enterprise Linux, CentOS, Scientific Linux and Oracle Linux via Extra Packages for Enterprise Linux (EPEL) as well as for other operating systems.[5]

Inventory File

Inventory file is the important component of Ansible. This file consist the IP addresses of all host machines. If same task has to be performed over some of the hosts then we can make their groups such as some IP address comes under the group *web server* where some web servers like apache, LAMP Stack need to be installed and some under the group *DBserver* where the server like MY SQL has to be installed. The example of an inventory file:[4]

[test-servers] 192.168.56.102
192.168.43.21
192.168.163.91
[web-servers] 192.168.43.91
192.171.12.21

Playbooks

Playbooks are the most important component on Ansible. In a layman language they are a way to send the commands to the nodes in a scripted way. Technically, playbooks are the component of Ansible which are used to manage the configuration and deployment to remote systems in the scripted way. They are also used in rolling update, to delegate the actions to other host and also interacting with monitoring servers and load balancer along the way. They are written in YAML data serialization format or language.
Playbooks consist of plays and plays consist of task which maps host to a function. Tasks are basically module calls.
The example below is a sample of playbook:[4]

- - -
name: install apache & php & mysql hosts: test-servers
become: true tasks:
name: “Install apache2”
package: name=apache2 state=persent name: “Install php-mysql”
package: name=php-mysql state=persent

4 Case Studies

NASA: The increasing Cloud efficiency with Ansible and Ansible Tower NASA needed to move approximately 65 applications from an old hardware based data center to a cloud-based environment for better activity and to cut cost. This resulted in many applications being migrated ‘as-is’ to a cloud environment. This created an environment spanning multiple virtual private clouds (VPCs) and AWS accounts which could not be easily managed. Even simple things, like ensuring every system administrator had access to every server, or simple patching became extremely complex.
The solution to this was the use of Leverage Ansible Tower to manage and schedule the cloud environment. As a result of implementing Ansible Tower, NASA is better equipped to manage its AWS environment. Tower allowed NASA to provide better operations and security to its clients.[6]

FATMAP: Increasing Speed of Application Deployment with Ansible Fatmap’s application development process was a complex process because they used 3D gaming technology in order to serve map content, the application build process involved a lengthy Meta programming pipeline and processing phase. Fatmap required a solution that would speed and automate this time-consuming process. Ansible’s simple automation framework has provided the power to deploy multi-tier applications quickly and reliably. As a result the Ansibles had made it more efficient by amalgamating its deployment best practices in one toolbox. And because of Ansible’s agentless design, it integrates easily with a variety of networks, infrastructures and OS and was introduced into FATMAP’s hybrid OS environment. [8]

Network Automation and Environment Provisioning for Improved Customer Experience

The customer bend towards cloud based services lead to the NEC to have hosted Unified Communication (UC) but it lead to the excess manual work and human error. NEC required a solution to increase the speed to market for new hosted UC customers, while utilizing the current team resources and reducing manual errors.
The solution to it was using Ansible and Ansible Tower to automate network builds. As a result, faster time to market for new SaaS customers, resulting in increased revenue, reduce errors, and add new auditing functionality.

CONCLUSION

Ansible is an automation tool which is been widely and maximally used amongst all tools throughout the world. Due its fine features and advantages it has brought the revolution in the industrial sector. With the help of this automation tool and its easy access the risk of error and human load has almost reduced to zero. Through the case studies we came to know that how *big fat giants* such as NASA, FATMAP and NEC has shifted towards the automation tool and how greatly it has enhanced their working and now they can execute two times of the task which they use to do earlier. After doing the deep study about automation tools, we conclude that Ansible is more preferable than others but it has also have disadvantage which need to be worked upon and hence after this study we get enlighten about automation tools, Ansible and their importance in the IT world.

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