A methodology of automation using ARM templates

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Abstract - We introduce Azure Resource Manager Templates (ARM templates), a methodology that is used by organizations to declutter unnecessary repetition of creating things like the infrastructure of Virtual Machines (VMs), Virtual Networks(VNets), Virtual Subnets, etc. We chose Azure because of its pay-as-you-go facility and free student account. VMs are fundamental units of cloud computing and Vnets are the heart of network architecture on Azure. Although we can create them manually but avoid complexity (if we need to deploy in huge numbers with almost the same configuration) and save time as some works are redundant. Also, the manual process may lead to errors and inconsistencies. We exploited the efficient usage of ARM templates and ended up making the unnecessary manual work into one-click work. We have created JSON scripts for creating Vnet with multiple subnets (number of subnets can be changed by the user as per the requirements), for creating VM using IaaC with the desired number of OS images to choose from so as to have simplicity for users and lastly we created a JSON script of CPU alert metric which will inform us via e-mail when our VM uses more than a threshold percentage of CPU.

Keywords- Virtual Machine(VM), Virtual Network(VNet), Subnet, IaaC, alert metrics.

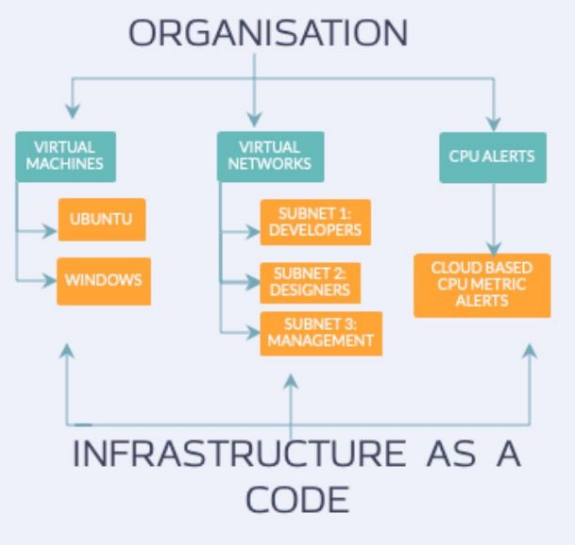
INTRODUCTION

ARM templates, also known as Azure Resource Manager templates, are JSON files used to create and configure Azure Infrastructure declaratively using IaaC. Infrastructure as Code is a process of managing and provisioning computing infrastructure with some declarative approach while setting their configuration using definition files instead of conventional interactive configuration tools.

Azure Virtual Network is the fundamental structure for any private system in Azure. TCP, UDP, and ICMP TCP/IP protocols within Virtual Networks are easily implementable. Virtual Networks further can be subdivided into subnetworks called subnets when differential access is required among different groups of employees/users.

Virtual Machines (VM's) are similar to Physical devices (PDs) or Physical computers (also called bare metal servers) in functioning. They have their own OS and applications. There are a lot of Virtual Machine Images available like Linux, Windows, CentOS, etc.

We took the existing ARM Templates and tried implementing them. We noticed that though we get ARM Templates on the internet, they were doing the same task which could be done manually easily. So we tried experimenting with them and took some basic tedious tasks that are done in every organization which requires automation and consistency.



PROBLEM STATEMENTS

From an organization's point of view, Virtual Networks and Virtual Machines are among the most essential infrastructures to maintain and configure for different groups of employees.

Problem Statement1: Creating Vnets with subnets is the most basic task and they are created in huge numbers so if we give manual input every time to create them then it leads to inconsistency, wastage of time, energy, and efforts.

Problem statement2: The second problem was something we too face a lot of times that we deploy a VM with the wrong configuration. In industries, while creating VMs, we have too many OS image options available which leads to deploying a wrong VM, especially in the case of a fresher. This leads to a lot of confusion and wastage of money which could be easily avoided by giving limited options and lead to simplicity.

Problem statement 3: Sometimes, there can be anomalous CPU utilization which could lead to the VM exhibiting longer response time and inability to accept connections.

PRACTICAL WORK

Solution 1: Firstly, we created an ARM template for Vnet with 2 subnets and this reduced the redundancy. We deep-dived into this subject and then implemented a loop inside this to create the number of subnets asked by the user which gives the flexibility to the user to choose the number of subnets required by him.

Solution 2: We made tweaks in our code (as shown in our git file) to limit the OS images to Ubuntu and Windows only. Also, VM size is also set there by default, which could be changed, but this avoids the mistake of sometimes selecting an expensive VM due to lack of knowledge.

Solution 3: We made changes in our code by exploiting the concept of CPU metric such that we are able to set a certain threshold value, so if a particular VM uses more CPU than the threshold, we get notified via email and we could look into the matter.

CONCLUSION AND FUTURE WORK

In this paper, we have introduced ARM templates and some of its usage in Industries. We worked on setting up virtual machines, virtual networks with their subnets, and CPU alert system. But, they are not the only use case of ARM templates. For every organization, different ARM templates are required. Further, we plan to give the user the option to choose the number of VM he wants to deploy. Also, we are trying to implement 3 tier architecture using the same.

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