



Virtual Machine Scheduler

Team 14

NCGs

- Neeraj Menon S
- Vaibhav Pundir
- Harita Chaudhari
- Anamya Agarwal

Mentors

- Harmanpreet Singh
- Ayan Chakravorty

Facilitator

- BhanuKiran Karanam

Language

- UI – React.JS
- Backend – Java
- SQL

Tools

- IntelliJ IDEA
- Postman
- DBeaver
- Visual Studio Code

Framework

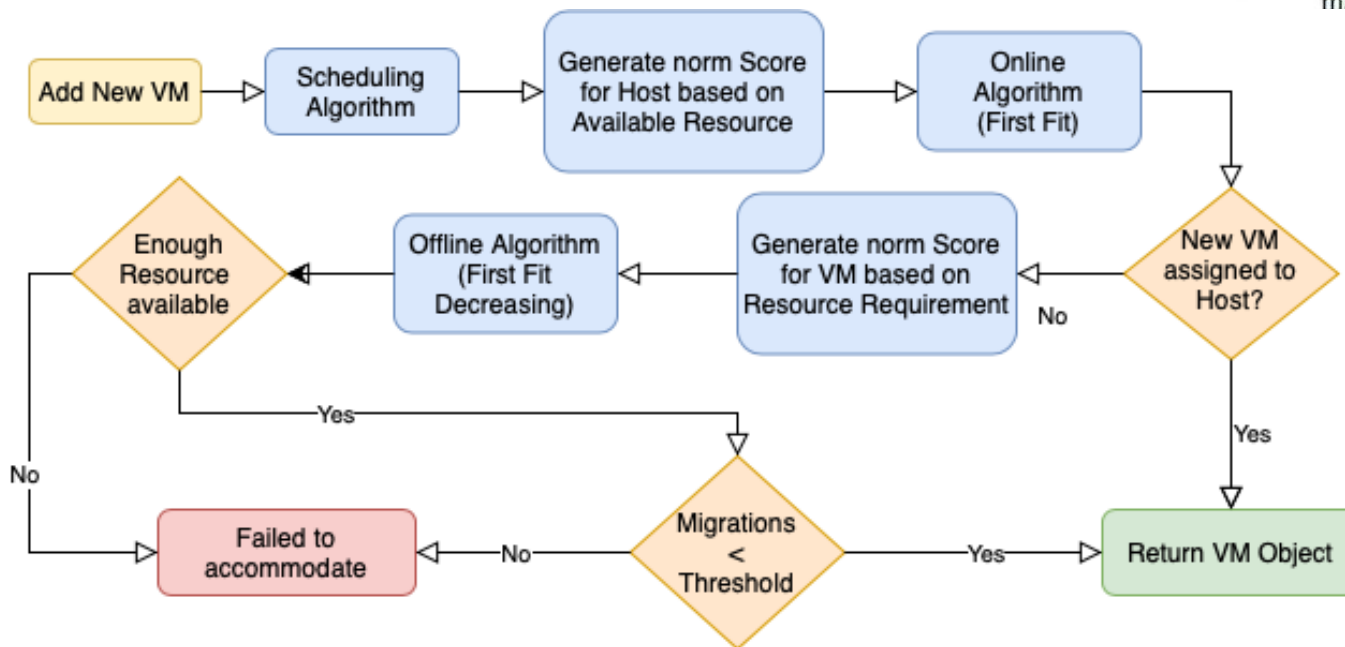
- Vmware Clarity
- Spring

- Identified the problem as **Bin Packing Problem**, where hosts are bin and VMs are items
- 2 approaches –
 - Online – First Fit Algorithm (FF)
 - Offline – First Fit Decreasing Algorithm (FFD)

Algorithm	Approximation guarantee
First-fit-decreasing (FFD)	$FFD(I) \leq 11/9OPT(I) + 6/9$ [25]

Using min-max Normalization scheme to give score to each VM

$$z = \frac{x - \min(x)}{\max(x) - \min(x)}$$

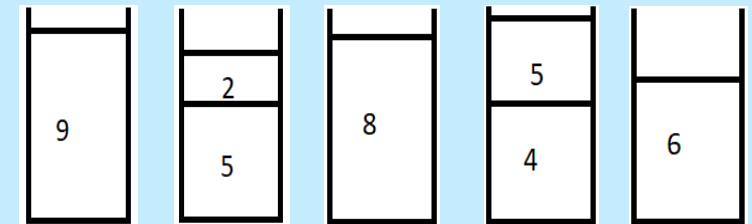


Assuming hosts have 10 core capacity

Input Stream

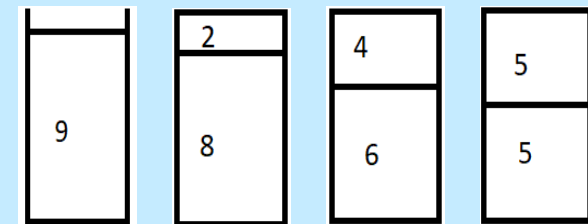
9 -> 5 -> 2 -> 8 -> 4 -> 5 -> 6

Using First Fit



Algorithm	Approximation guarantee
Next-fit (NF)	$NF(L) \leq 2 \cdot OPT(L) - 1$ [13]
First-fit (FF)	$FF(L) \leq \lceil 1.7OPT(L) \rceil$ [15]

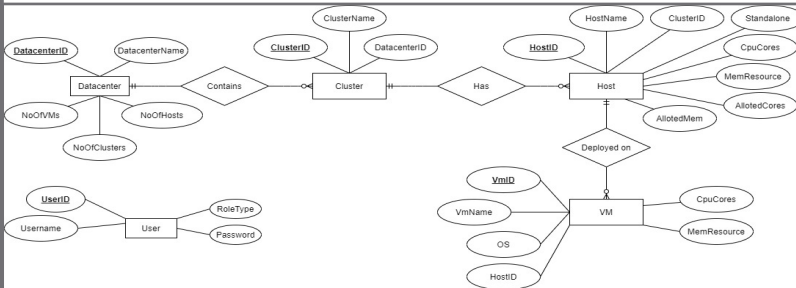
Using our Approach



Advantage – Lower number of hosts are required for the same VMs

v1

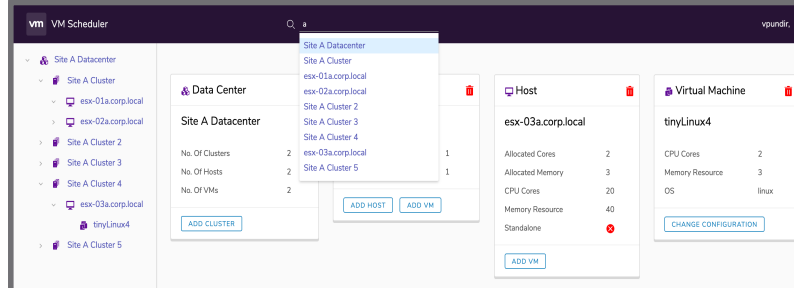
- Objects (DataCenter, Cluster etc.) defined
- ER Model



- Scheduling Algo is designed with option to deploy VM on cluster and ESXi host

v2

- APIs are Implemented for all operations
- UI Portal Designed



- Rebalancing (Migration) of VMs between hosts in the cluster to accommodate new VM
- Completed 30% Test coverage

v3

- Support for min-max VM requirement.
- When the VM host is changed and the existing VM does not have enough resource then the algorithm will do migration to support the new VM requirement.
- Algorithm supports adding Storage and Network parameters



- **Migration Threshold** is introduced, so that user can set the maximum allowed migrations while adding a new VM
- **Search support** for searching Datacenter / Cluster / Host / Virtual Machine for ease of use.
- **Energy Aware VM Scheduling algorithm**, makes use of minimum number of Hosts while scheduling
- **Relevant error messages** and codes are displayed like "Resource Not available" for the new VM
- For protecting the password of the user we use SHA – 256 and implemented spring boot with bcrypt

https://gitlab.eng.vmware.com/group-14-vm-scheduler/bootcamp_1