

CVS: A Cost-Efficient and QoS-Aware Cloud Video Streaming

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Video Streams

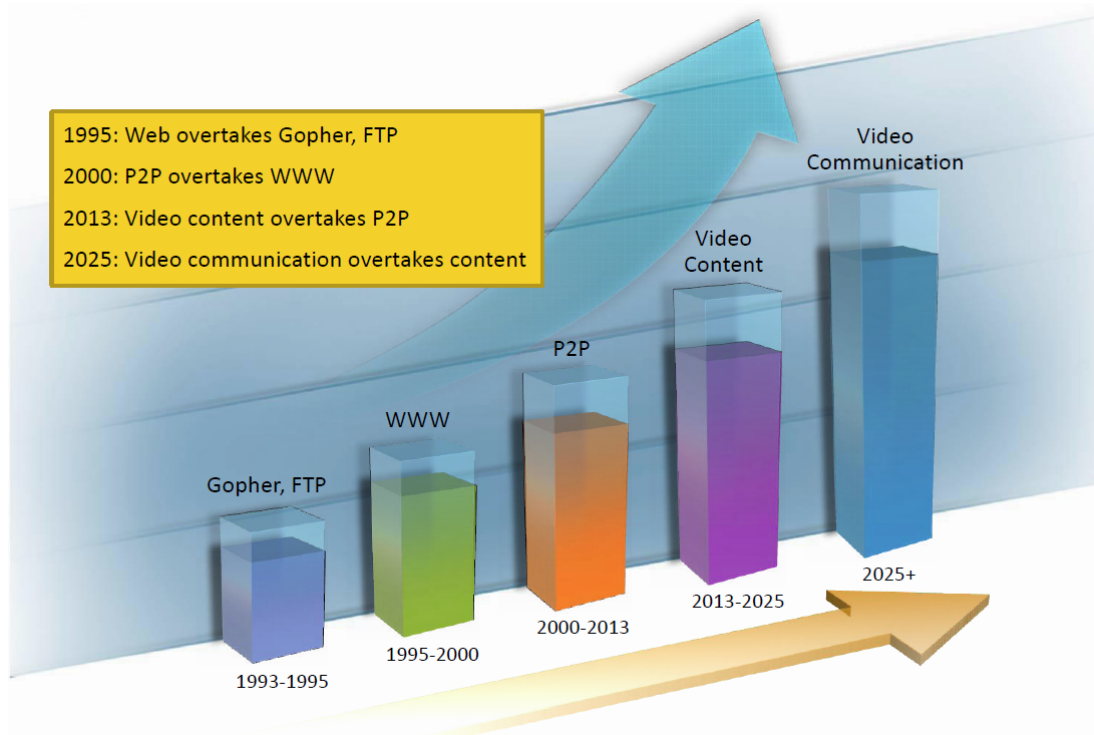


Streaming Providers



Client Devices





- Video streaming constitutes approximately **64%** of all the U.S. Internet traffic in 2014 [1].
- Cisco estimates that the streaming traffic will increase to **80%** by 2019 [2].

[1] G. I. P. Report, "<https://www.sandvine.com/trends/global-internet-phenomena/>," accessed Oct. 1, 2015.

[2] C. V. N. Index, "Forecast and methodology, 2014-2019," 2015.

- Storage solutions
- Hardware failover
- Networking infrastructure



- Video contents
- Customer experience



Region: US East (N. Virginia) ▾

vCPU

ECU

Memory (GiB)

Instance Storage (GB)

Linux/UNIX Usage

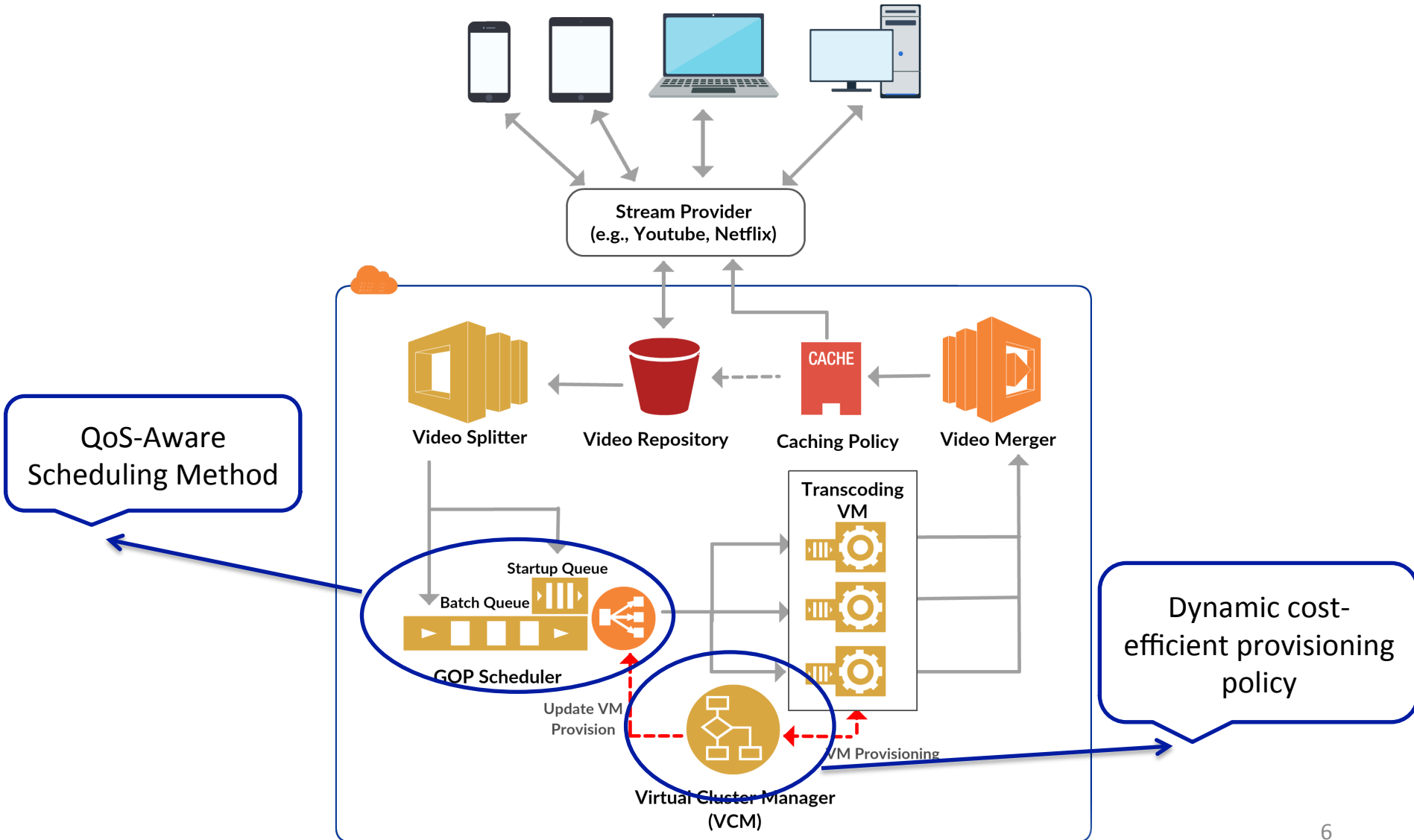
General Purpose - Current Generation

t2.micro	1	Variable	1	EBS Only	\$0.013 per Hour
t2.small	1	Variable	2	EBS Only	\$0.026 per Hour
t2.medium	2	Variable	4	EBS Only	\$0.052 per Hour
t2.large	2	Variable	8	EBS Only	\$0.104 per Hour

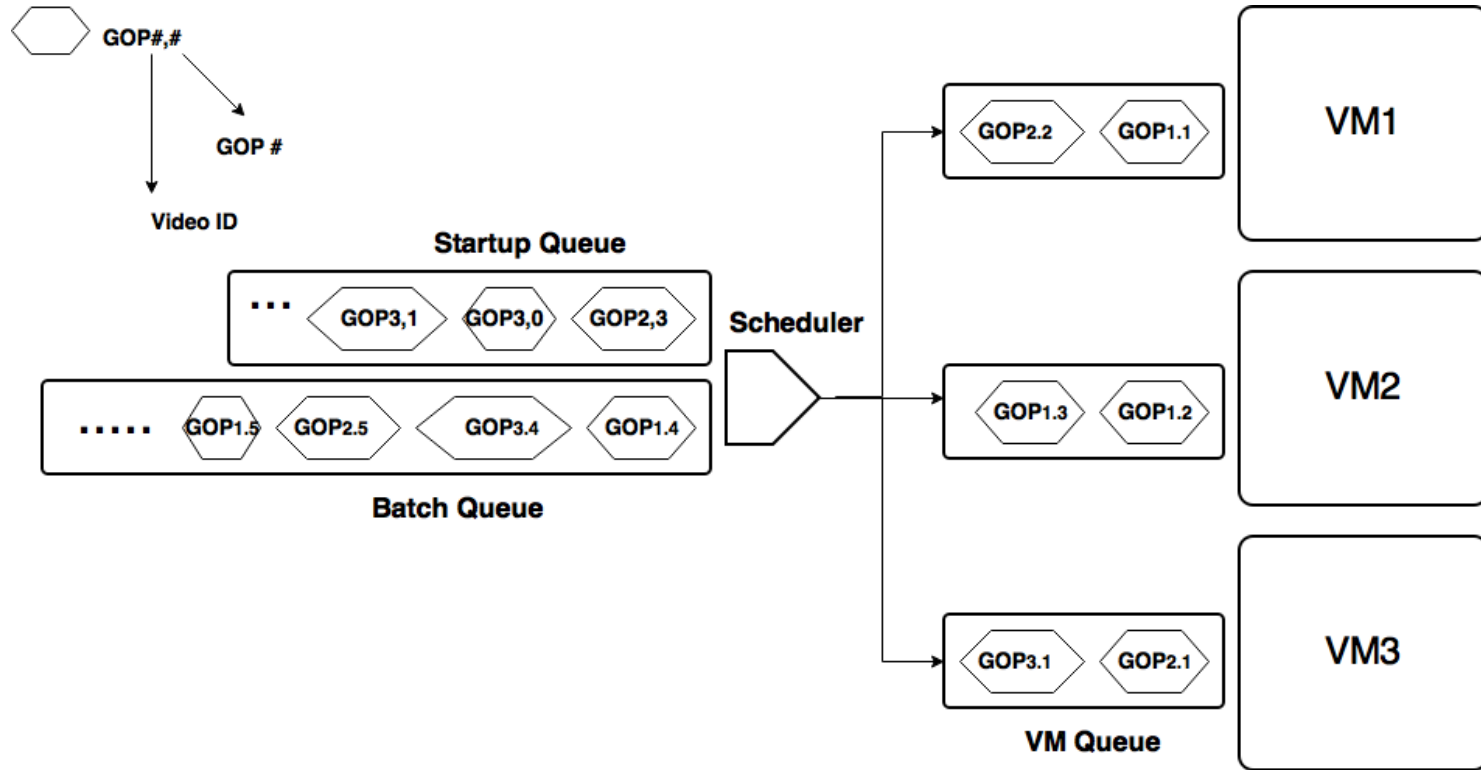
Pricing Examples

1. A 10 minute source file in US West (Oregon) transcoded to an SD output will cost $10 \times \$0.015 = \0.15 .
2. A 10 minute source file in US East (N. Virginia) transcoded to an HD output will cost $10 \times \$0.030 = \0.30 .
3. A 10 minute source file in EU (Ireland) transcoded to one SD and one HD output will cost $(10 \times \$0.017) + (10 \times \$0.034) = \$0.51$.
4. A 10 minute source file in US West (Oregon) transcoded to an audio-only output will cost $10 \times \$0.0045 = \0.045 .
5. A 10 minute source file in US West (N. California) transcoded to one audio output, three SD outputs and two HD outputs will cost $\$0.00522 + (3 \times 10 \times \$0.017) + (2 \times 10 \times \$0.034) = \$1.2422$.

Cloud- based Video Streaming (CVS) Architecture



QoS-Aware Scheduling Method



Step1: Search for the shortest completion time VM.

Step2: Insert GOP from startup queue in front of the GOP in the batch queue.

Step3: Check if the GOP in the batch queue will miss deadline or not.

Dynamic Cost-Efficient Provisioning Policy

I. Back to the future



$$n = (N_s - 1) / 10 \cdot \beta$$

II. Look to the past

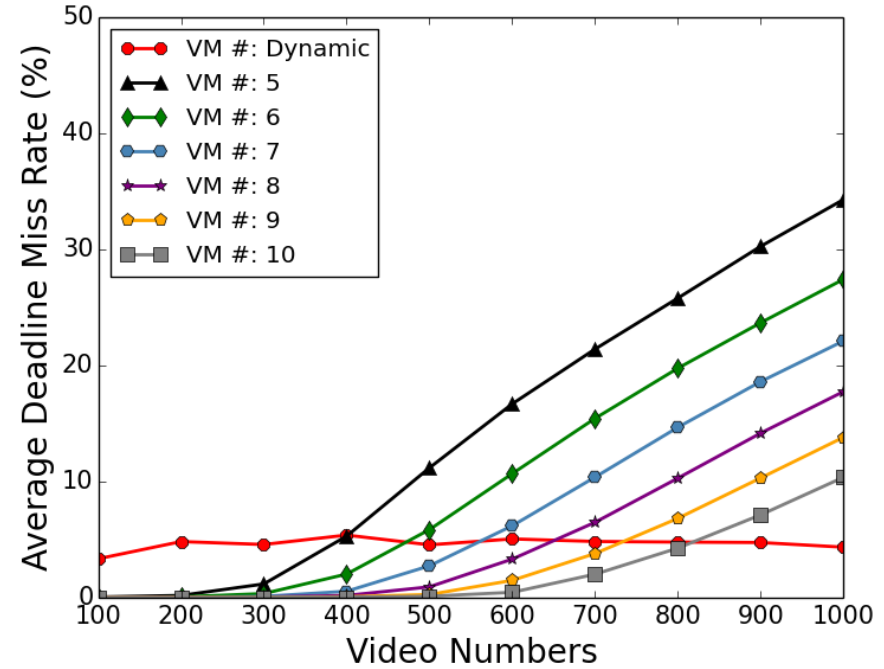
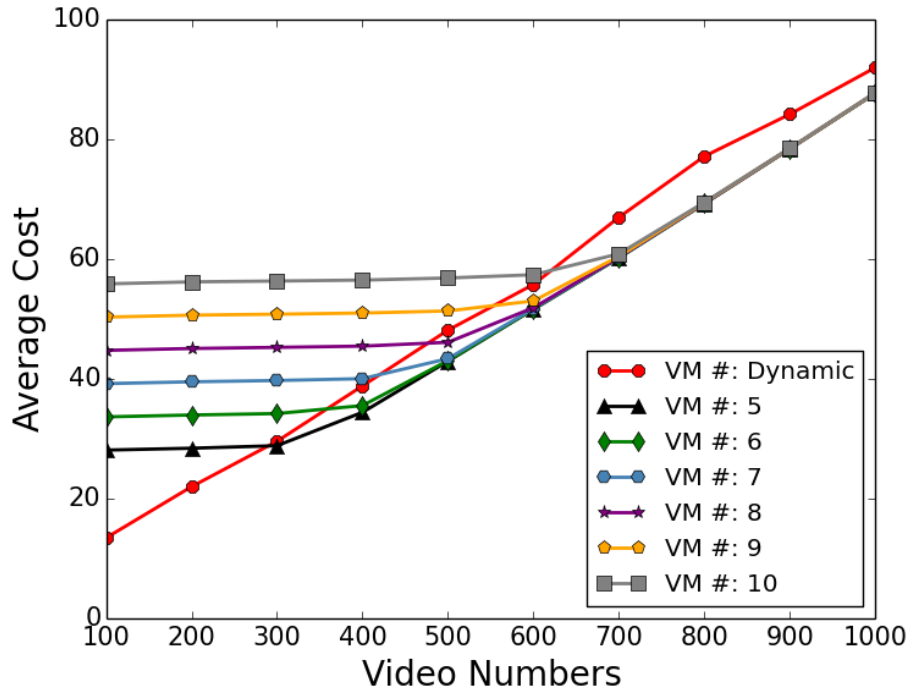
$$\gamma = n_\lambda / N_\lambda$$

Algorithm 2 Cluster Resource Resizing Policy

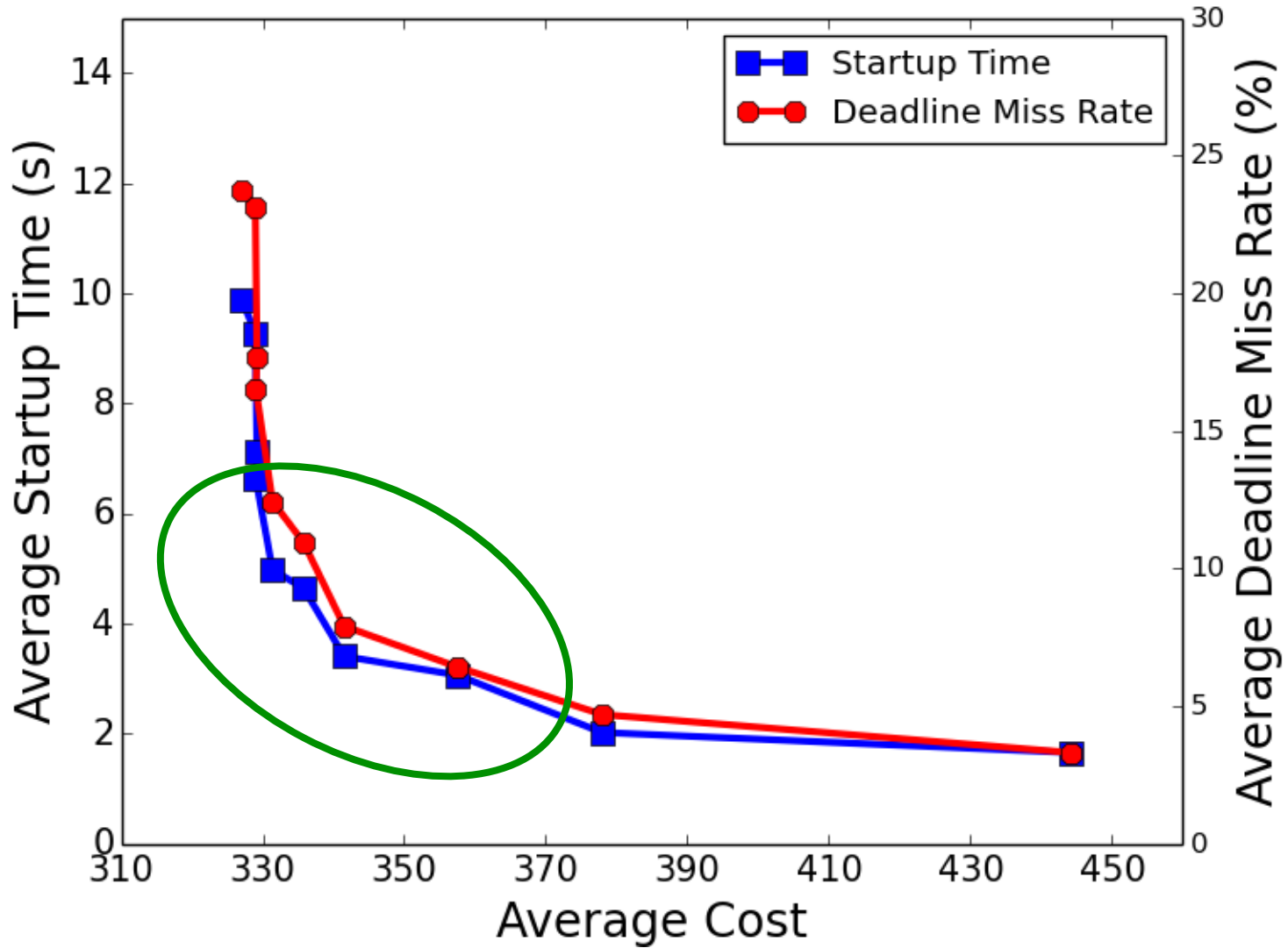
```
1: while true do
2:   Calculate current GOP's deadline miss rate  $\gamma_i$ 
3:   Calculate deadline missrate variation:  $\nu = \gamma_i - \gamma_{i-1}$ 
4:   Update previous deadline miss rate:  $\gamma_{i-1} = \gamma_i$ 
5:
6:   if  $\nu \geq 0$  &&  $\gamma_i \geq \beta$  then
7:     if  $\gamma_i < k \cdot \beta$  then
8:       Allocate one new VM
9:       break
10:    else
11:      Allocate two new VMs
12:      break
13:    end if
14:
15:   else if  $\nu < 0$  &&  $\gamma_i < \alpha$  then
16:     Find the minimum remaining time VM and set its
17:     flag to be destroyed
18:     break
19:   else
20:     No VM allocation or deallocation
21:     break
22:   end if
23: end while
```

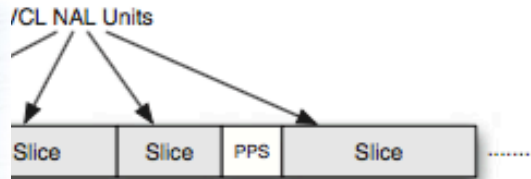
Performance Evaluation

❖ Our dynamic system keeps the QoS violation constantly low and Stable in compare with static method.

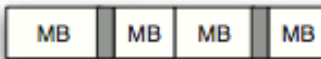


❖ Our method save the cost when the system is not oversubscribed.





Live



Quærskiossi?