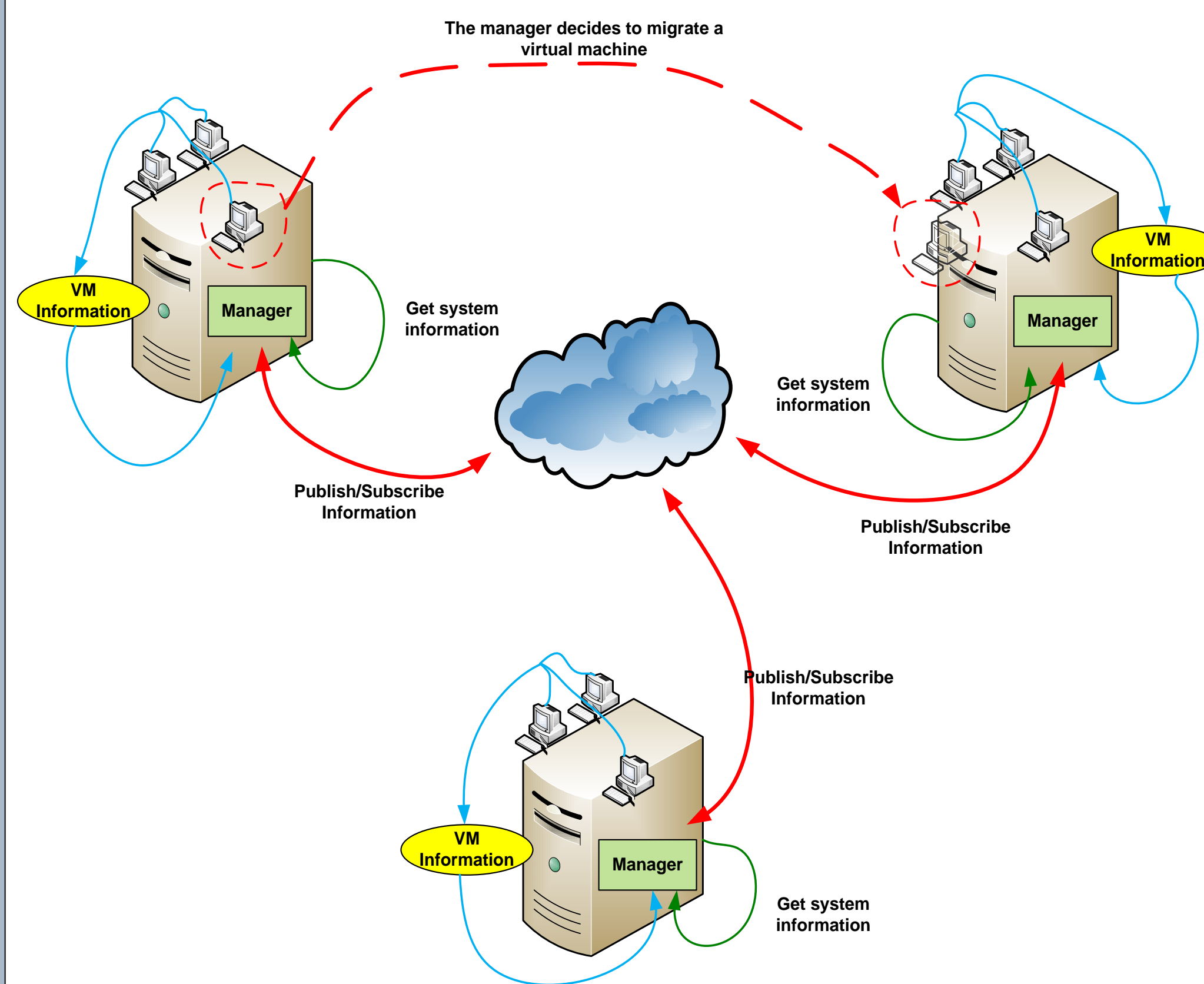


Abstract

- **Cloud Computing:** Accessing the computing resources through the network
- **Virtual Machines** are deployed in this type of infrastructures
- It is necessary to provide the necessary computing power when needed
- This autonomic system manages these virtual machines
 - All servers monitor their performance
 - This information is shared among all servers
 - If one server is overloaded, it tries to migrate virtual machines
- The system follows the Monitor-Analysis-Plan-Execute loop
- The system fulfills the self-CHOP rules

Overview

- **Server Group:** Servers that can host the same virtual machines
- Each server runs an autonomic system
- The autonomic system collects information about itself
- The servers share the information with the server group
- The autonomic system makes a decision about migrating a VM
 - If the server is overloaded
- Migrating a VM must not generate overload in other server



Materials

- Hypervisor



- Virtual Machines API



- Server information



- Messages exchange



Design

MONITORING PHYSICAL SERVERS PARAMETERS

Active Virtual Machines
Inactive Virtual Machines
Server Load
Number of CPUs
Used Memory
Total Memory
Used Memory Percentage
Network Interface usage

SYSTEM THRESHOLDS

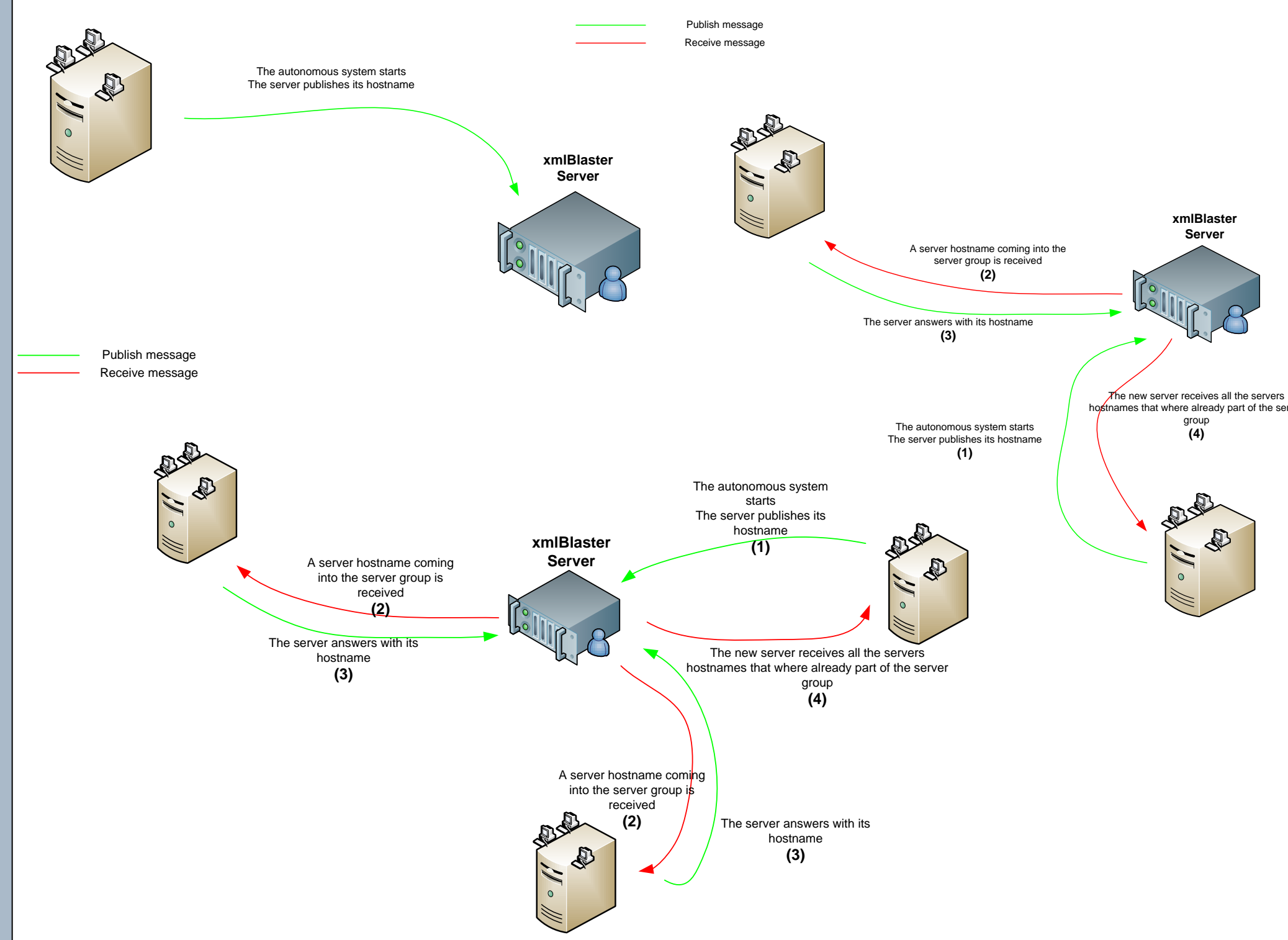
Maximum-load
Maximum-load-time
Waiting-time

MONITORING VIRTUAL MACHINES PARAMETERS

Load generated by the virtual machine in the server
Network Interface usage

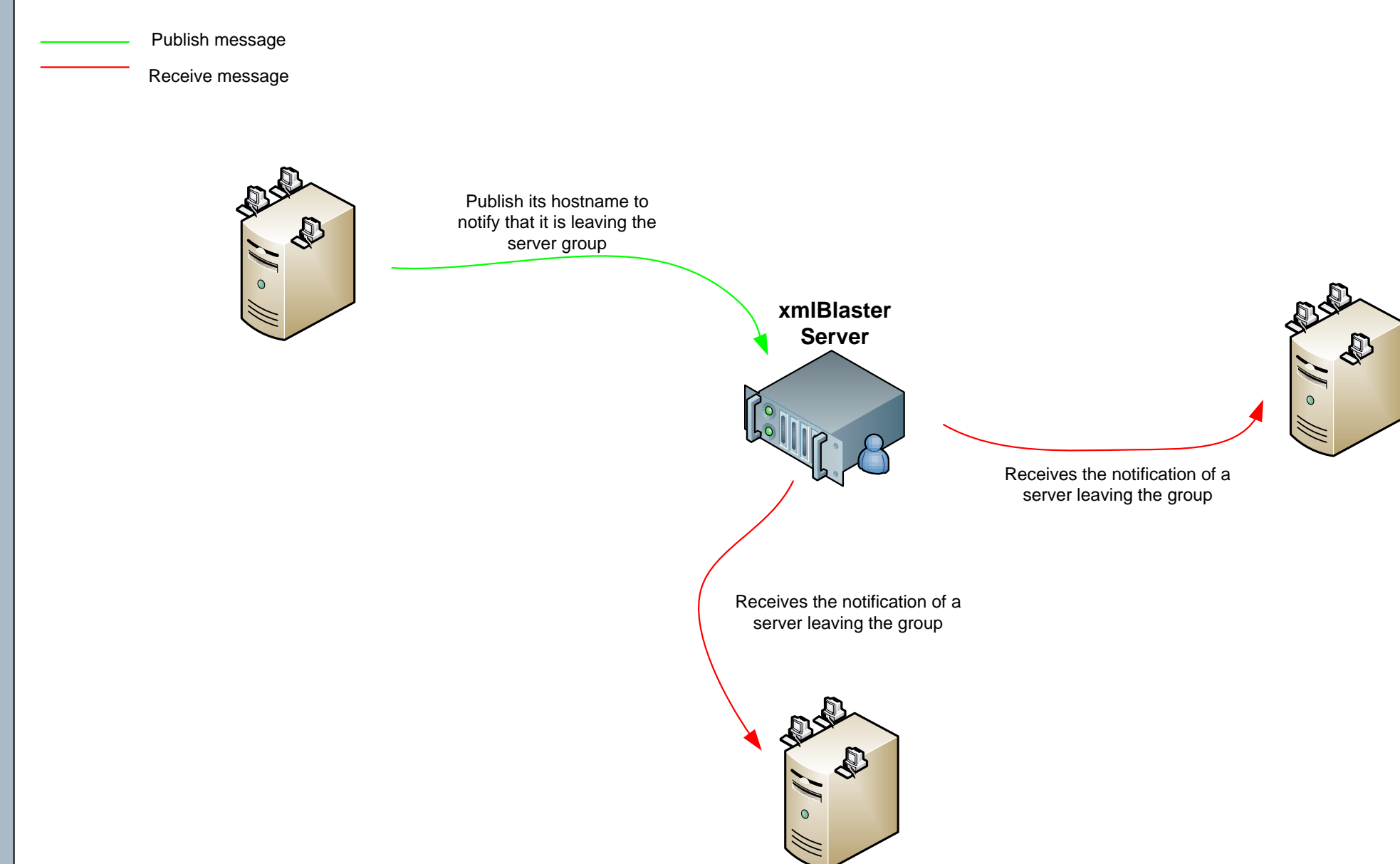
Joining the server group

- If a server joins the server group
 - It publishes its name to the server group members
 - The rest of servers in the group include the new server in the list of active servers



Leaving the server group

- If a server leaves the server group
 - It publishes a message with its hostname
 - The rest of the server in the group must erase it from the list of active servers



Virtual Machines Reallocation Algorithm

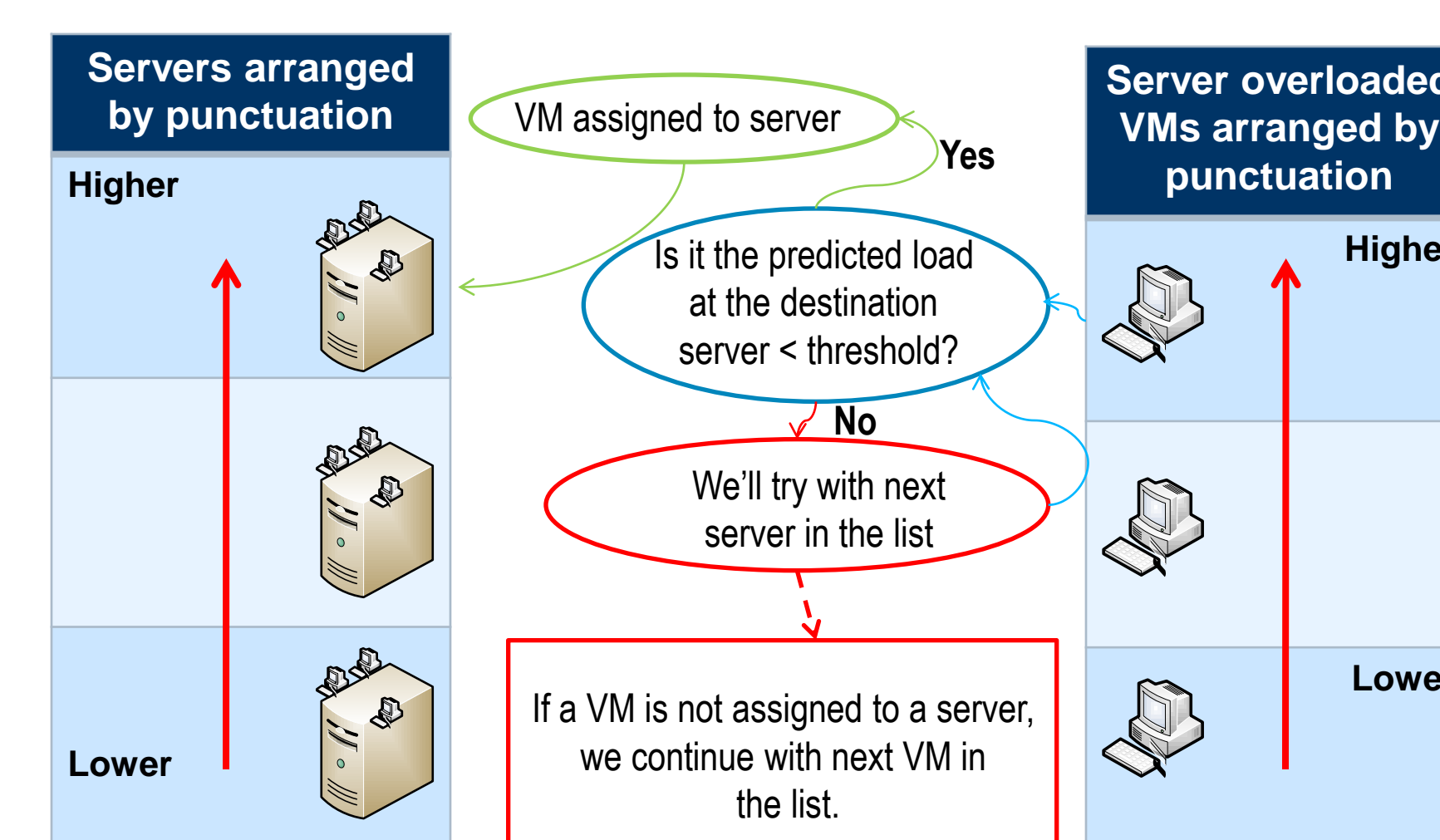
- If a server is overloaded it initiates a process to migrate virtual machines to other servers in the server group.
- First, servers are scored according to the monitoring parameters

Server properties	Server punctuation
• Hostname: Server1 • Active VMs: 1 • Inactive VMs: 4 • CPU load: 0.04 • Number of CPUs: 8 • Total memory: 8 GB • Used memory percentage: 0.6	HIGHER 2.247
• Hostname: Server 2 • Active VMs: 3 • Inactive VMs: 3 • CPU load: 0.2 • Number of CPUs: 8 • Total memory: 8 GB • Used memory percentage: 0.5	1.994
• Hostname: Server 3 • Active VMs: 5 • Inactive VMs: 1 • CPU load: 0.55 • Number of CPUs: 8 • Total memory: 8GB • Used memory percentage: 0.65	LOWER 1.602

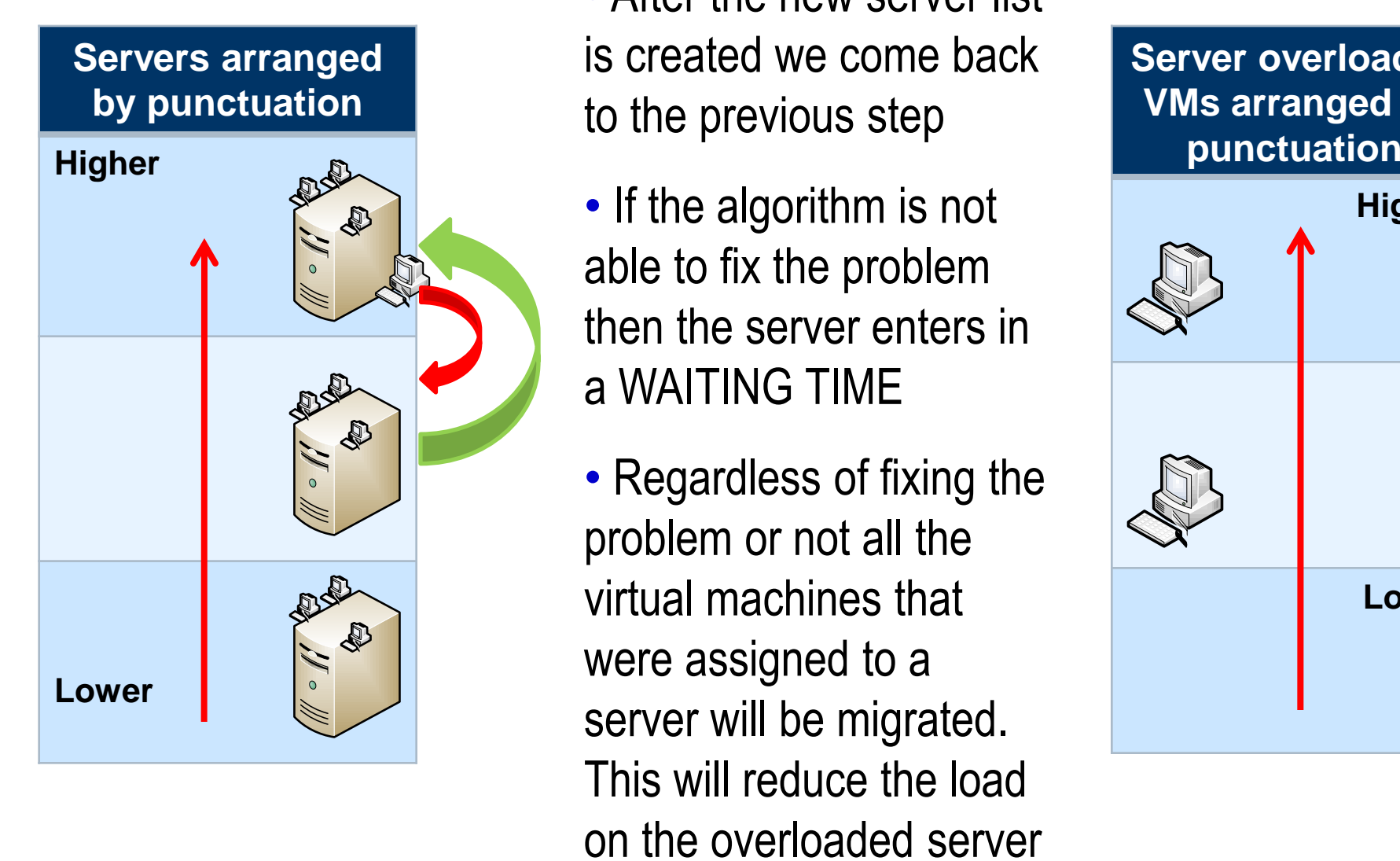
- After this, the overloaded server manager assigns a score to the virtual machines running on it

VMs of the overloaded server	VMs Punctuation
• Load generated by the VM on the server: 0.4 • Downlink utilization: 0.03 • Uplink utilization: 0.01	HIGHER 0.287
• Load generated by the VM on the server: 0.2 • Downlink utilization: 0.03 • Uplink utilization: 0.01	0.147
• Load generated by the VM on the server: 0.05 • Downlink utilization: 0.03 • Uplink utilization: 0.01	LOWER 0.042

- The virtual machines with higher punctuation are reassigned to the servers with higher punctuation when possible.



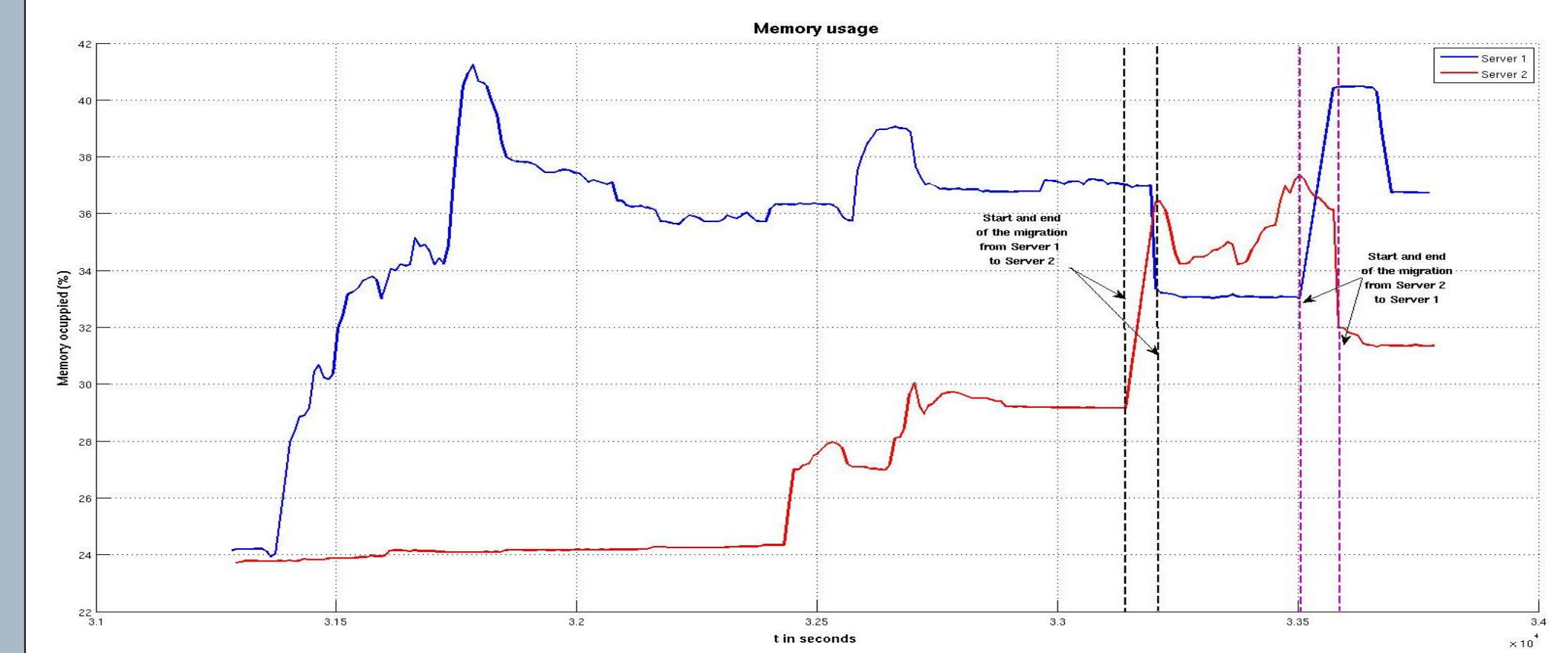
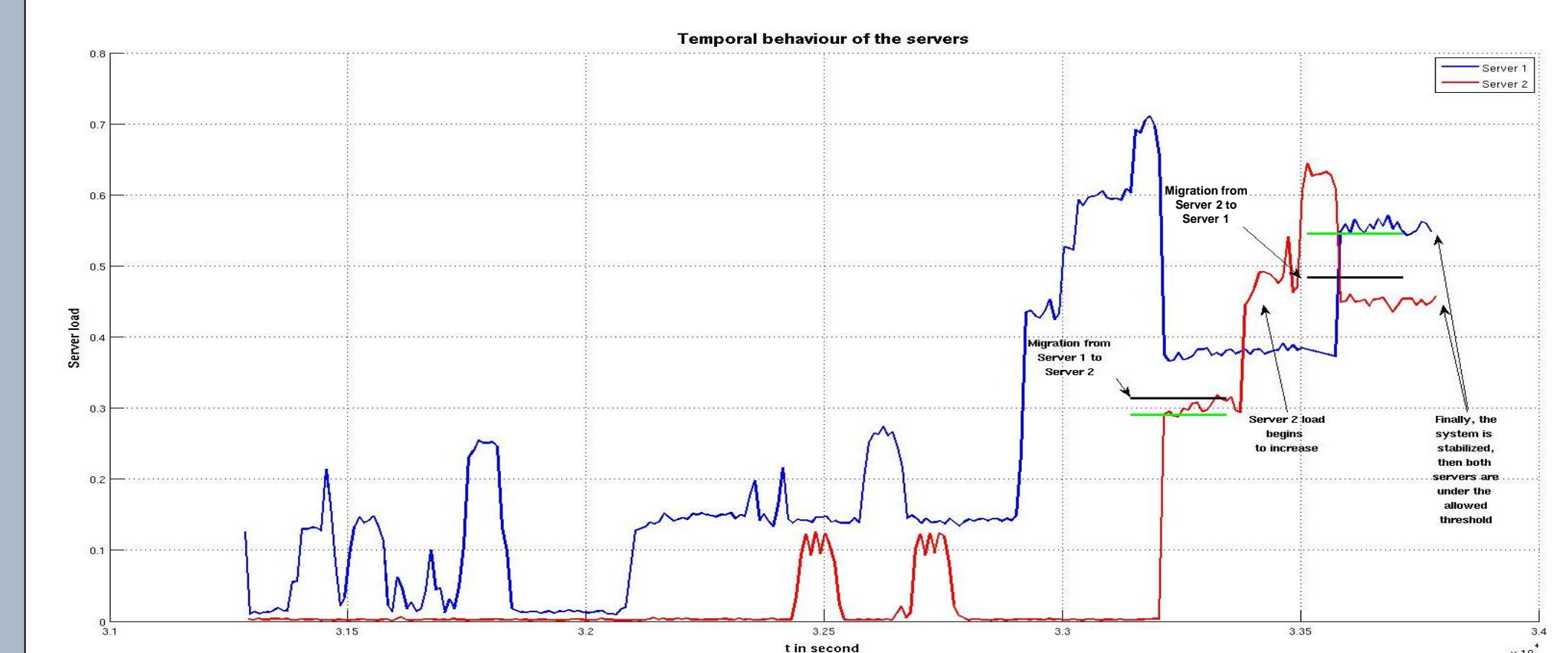
- After a virtual machine is reassigned to a server, the scores in the server list are recalculated



Results

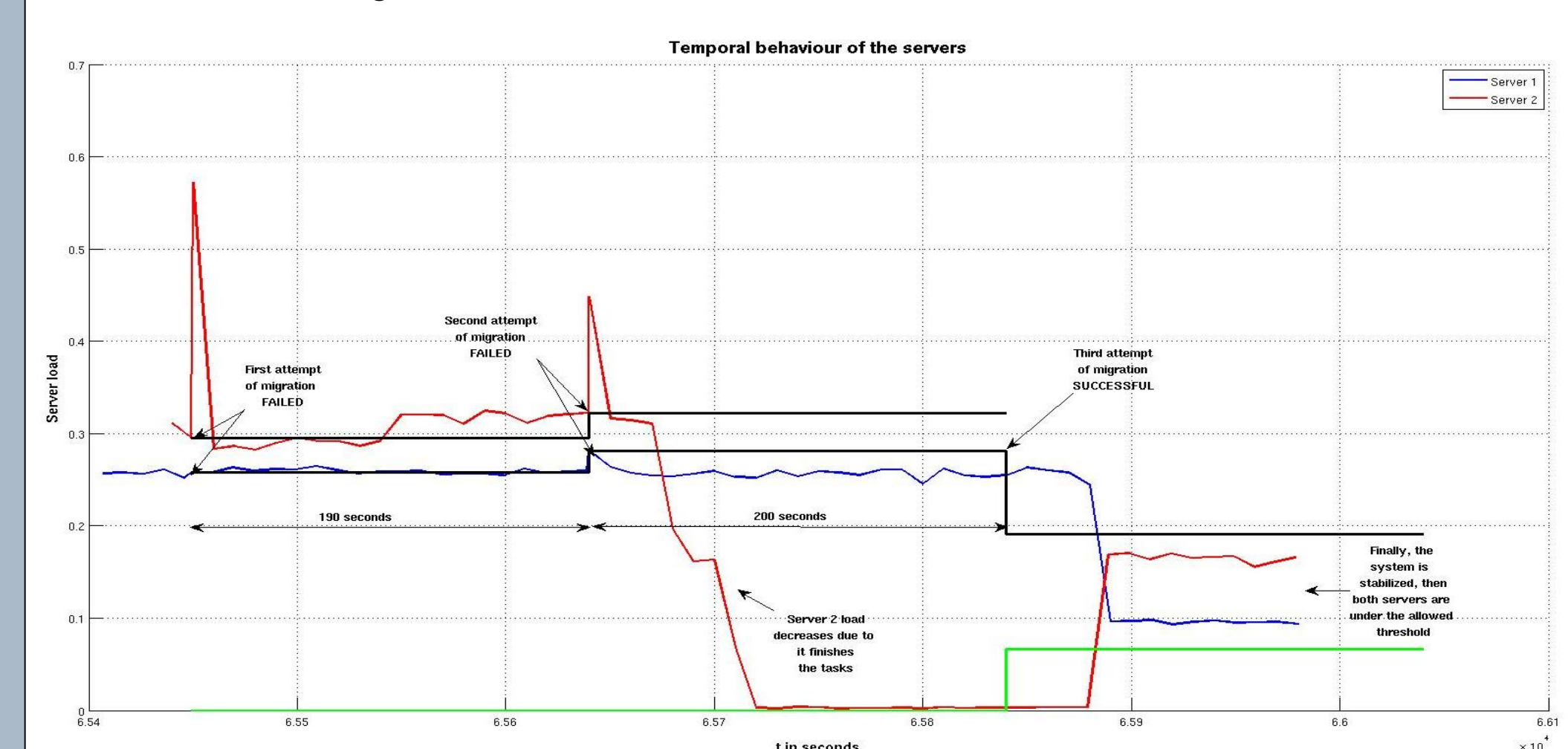
Test 1:

- Load Threshold: 60 %
- Consecutive load measurements over the load threshold: 2



Test 2:

- Load Threshold: 20 %
- Initial waiting time: 190 seconds



Conclusions

- Migrating decisions are based on server load
- Decisions could also be based on memory, but:
 - It doesn't vary as quick as the load
 - It increases reasonably when a virtual machine is started or powered off
- All the memory is transferred to the new server when a virtual machine is migrated
 - It is necessary to know if there is enough memory at the destination to host the new VM
- Load prediction is not totally precise
 - Errors are small and therefore they are acceptable
- Decision algorithm is quicker than others

Contact information

