Experiences Using Chameleon in a Cloud Computing Course

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Chameleon Users Meeting

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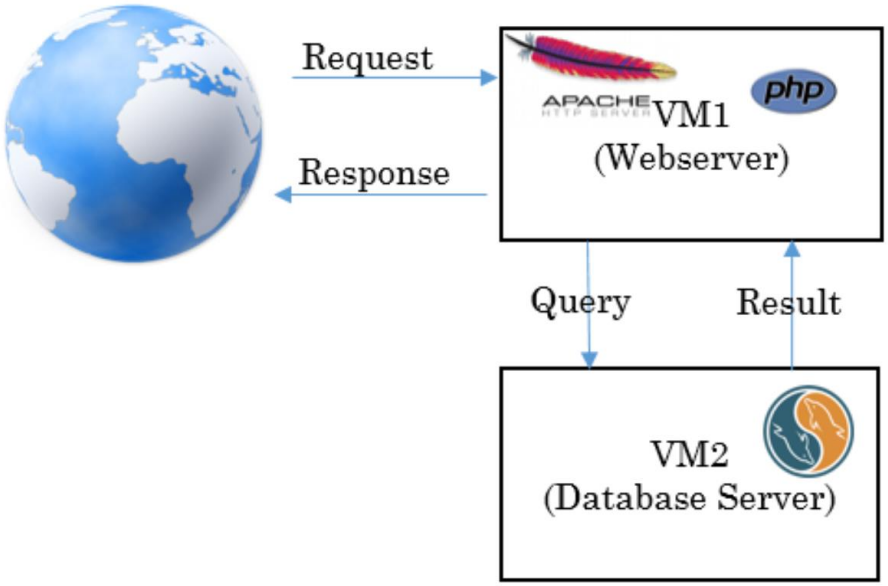
CS4287/5287: Principles of Cloud Computing

- Cloud computing course offered at Vanderbilt University every Fall semester
  - Crosslisted across undergraduate and graduate students
- Focus on principles (theory) and team-based programming assignments (practical, hands-on)
- We chose Chameleon for our four programming assignments
- End of semester project on advanced cloud platforms
  - e.g., AWS

Assignment #1

- 3 tier application
- Students were asked to provision the second tier (Apache httpd) and third tier (MySQL DB) using the Chameleon GUI
- Tier 1 (browser) on their laptops
- Students were asked to note the number of steps needed to provision the entire application

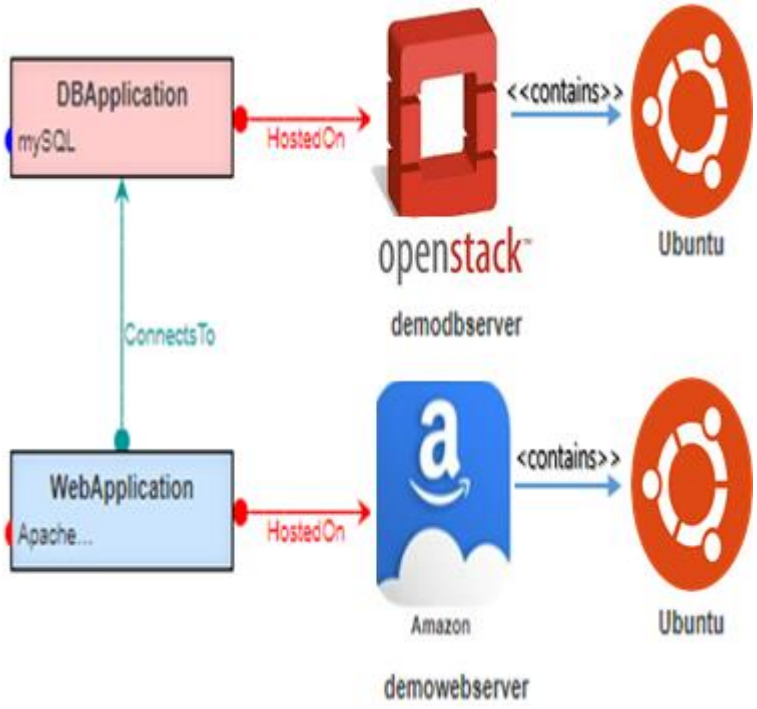


Assignment #2

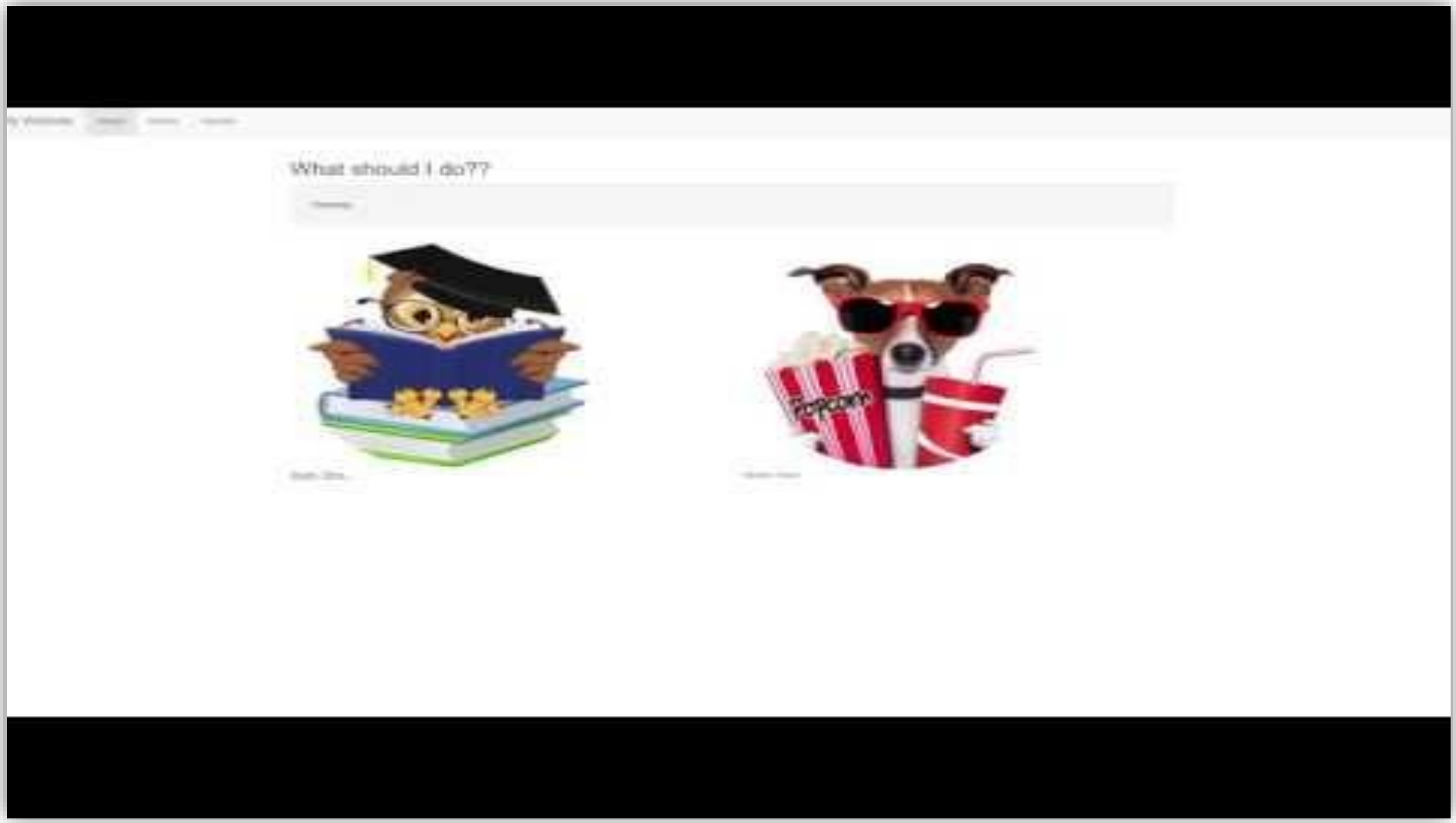
- Repeat Assignment #1 using DevOps tools
- Goal was to introduce students to DevOps tools like Vagrant and Ansible
- Steep learning curve, and multiple trial and error efforts to get the Vagrant/Ansible automation right
- However, we surmise these initial efforts will be amortized over multiple cloud deployments

Assignment #3

- Repeat Assignment #2 using research-based tooling
- Graduate students in Prof. Gokhale's group have developed a model-driven engineering based framework called CloudCAMP
- Users describe their application structure using intuitive visual notations
- Framework generates Vagrant/Ansible scripts and automatically invokes these to deploy the application
- Teams completed their assignment significantly faster than the other two assignments

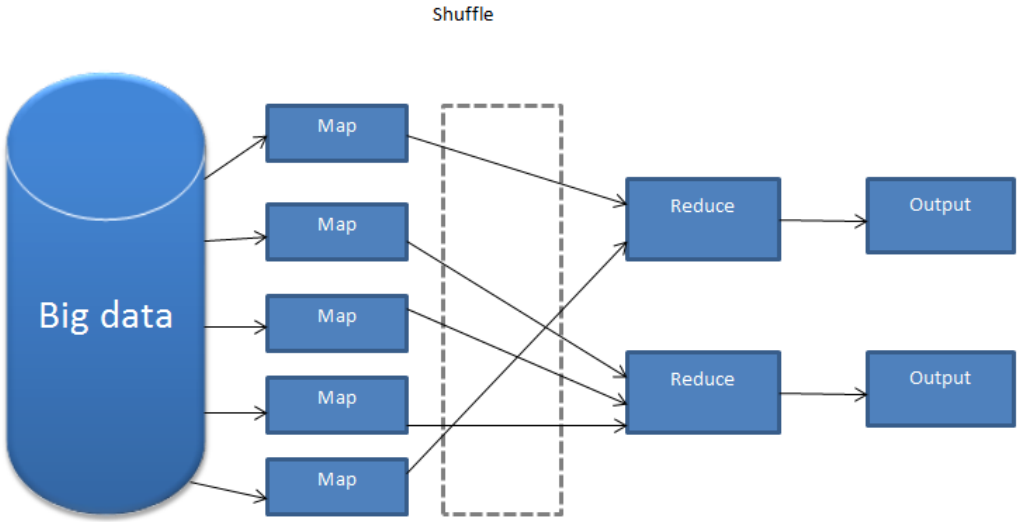


CloudCAMP Video



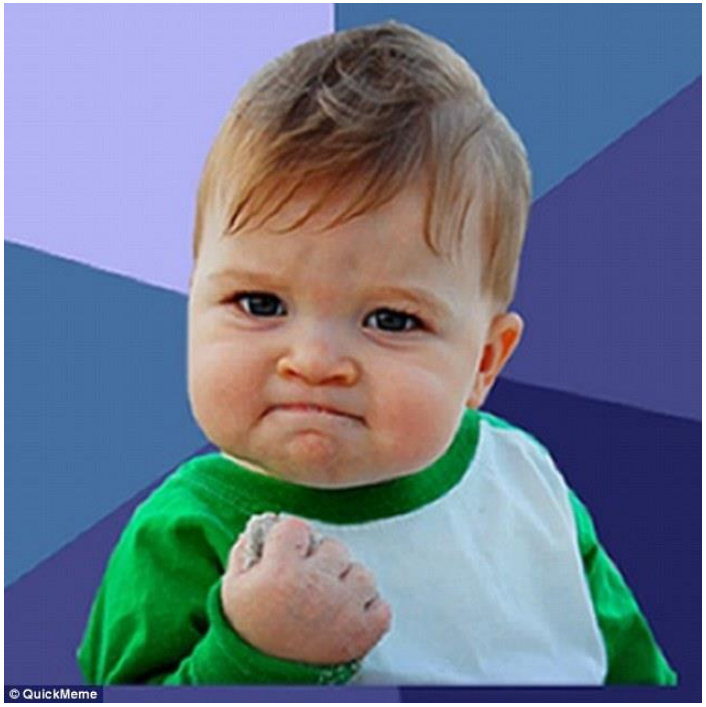
Assignment #4

- Create a Docker container Swarm network across a small number of virtual machines in Chameleon
- Use the swarm as worker nodes to solve a map-reduce problem
  - Taken from ACM DEBS 2014 challenge problem comprising energy data for a collection of smart homes
- Map-Reduce framework was homegrown
  - In future we plan to use Hadoop or Spark

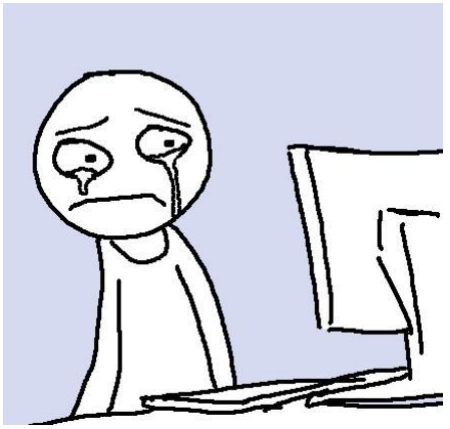


Benefits of Using Chameleon

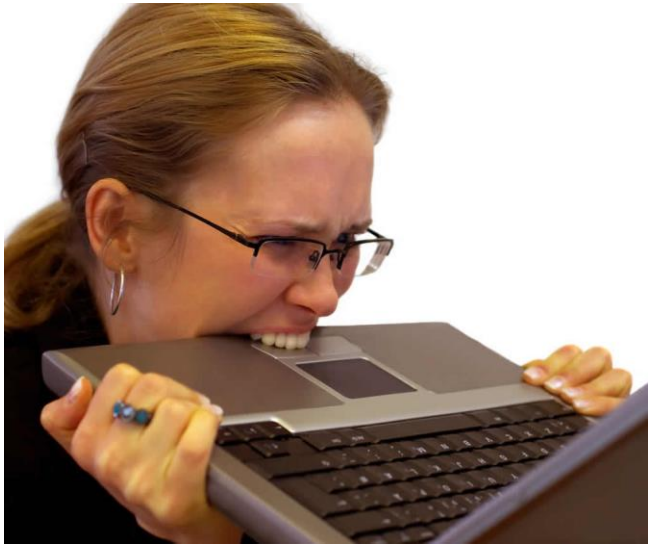
- Modest number of features did not overwhelm students and the barrier of entry was minimal
- Available features good enough for basic cloud computing applications
- Free
- Quick response time



Issues Encountered

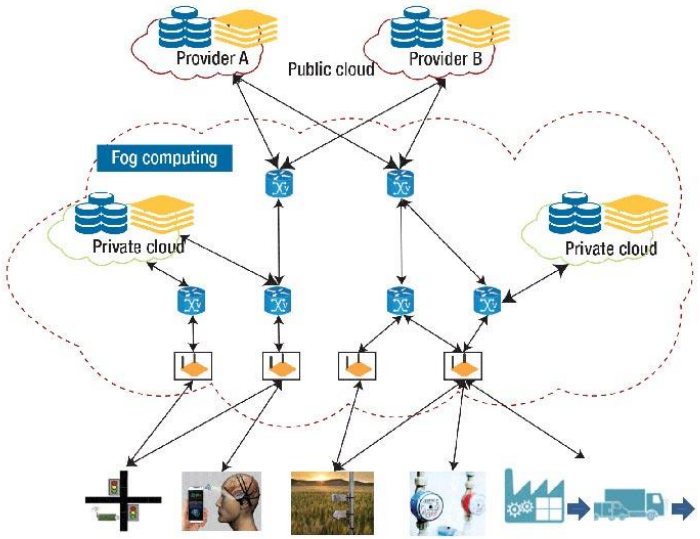


- The system performance was very unpredictable
  - VM creation time > 10 min
  - ssh connections to VMs at times just would not work
- Limited floating IPs and limited instances
- We surmise that some VMs were getting allocated on 32 bit machines.



Ongoing and Future Use

- Currently Prof. Gokhale is using Chameleon for his graduate-level Distributed Systems course
  - Smaller class than the Cloud Computing class
  - Assignments will include using ZooKeeper, DHTs, and several other frameworks to build a variety of distributed systems applications
- We also want to use other features like bare metal, SDN features, GPU/FPGA features
  - Both for teaching and research



Support Team

- Thank you!
- Very quick response time
- Very helpful

Thank you!

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