Breaking into the curriculum — OpenShift in the classroom

The University of North Carolina at Chapel Hill

Michael McNeill, Solutions Engineer
William Mowery, Solutions Engineer
May 9, 2018
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

- Nation’s first public university, founded in 1789
- 18,862 undergraduate students and 11,049 graduate students
- 11,772 faculty and staff
- $2.4 billion operating budget
IT LANDSCAPE

Central IT
- ~400 staff
- Networking
- Operations (servers/VMs, operating systems, data centers)
- Applications (web servers, J2EE, ERP)
- User Support
- Research Computing

Departments, Schools, Centers
- ~400 staff
- School of Medicine
- College of Arts and Sciences
- Business School
- Lineberger Cancer Center
- Specialized department systems
OUR GOAL
OUR GOAL
Providing a rapid application development and deployment service
OUR GOAL
Providing a rapid application development and deployment service
LEGACY JAVA PLATFORM MIGRATION

Internal platform to migrate from our legacy Java platform
EXPECTATIONS
Expectations
Security

IP Reputation Blocks: 33,105 IPs
Blocked IPs

WAF Blocks: 262 Blocks
WAF ASM Blocks

DoS Mitigations: 68 Mitigations
DoS Attack Mitigations
THE CLASSROOM
THE CLASSROOM

What we didn’t fully expect...

- Wider adoption
- Customer support
- Student savings
- Teaching!
THE CLASSROOM
Learning playground

- PHP
- Java
- Python
- Node.js
- .NET
THE CLASSROOM
Teaching more than just web applications
THE CLASSROOM
Deprovisioning and ownership

Transient user-base
- Personal project spaces
- Departmental project spaces
- Deprovisioning policies
CHALLENGES AND HOW WE ADDRESSED THEM
CUSTOMER CHALLENGES

Teaching new technologies

- Expectations versus reality
- Different workflow
- Varying levels of skill, knowledge, and familiarity
CUSTOMER CHALLENGES

Teaching new technologies

Command line...

```bash
$ ssh-keygen -t rsa -b 4096 -N "" -f ~/.ssh/cloudapps_key
Generating public/private rsa key pair.
Your identification has been saved in ~/.ssh/cloudapps_key.
Your public key has been saved in ~/.ssh/cloudapps_key.pub.
The key fingerprint is:
SHA256:mEM1B2Shj40kd2JSKXS6bTN/2AbCEMJN6ib7ZAKJ0Q
The key's randomart image is:
```
```
CUSTOMER CHALLENGES
Teaching new technologies

Git...

https://xkcd.com/1597/
CUSTOMER CHALLENGES

Teaching new technologies

Builds...

Pods...

YAML...

Containers...

...what?
CUSTOMER CHALLENGES
Teaching new technologies

The solutions:

- Extensive help documentation
- Walk-through videos
- Classroom instructional sessions
- Campus workshops
- Developer liaisons
- Feedback loops
CUSTOMER CHALLENGES

Creating SSH Keys

If you already have SSH keys you use for other services, you could reuse them for Carolina CloudApps. However, we advise you to create a new key pair to use exclusively for the Carolina CloudApps platform. We will walk through the steps to create a new SSH key pair below.

Creating Keys in MacOS

1. To create a new SSH key pair, open the MacOS Terminal application.
2. Run the following command:
   ```bash
   ssh-keygen -t rsa -b 4096 -N '' -f ~/HOME/.ssh/cloudapps_rsa
   ```
   In the above example, replace `HOME/.ssh/cloudapps_rsa` with the location on your local computer where you want to save the SSH key pair. This will create two files: `cloudapps_rsa` (the private key) and `cloudapps_rsa.pub` (the public key).

Creating Keys in Microsoft Windows

Using Putty

Putty is an SSH client for Microsoft Windows. You can download the software from [http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html](http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html). If you choose to install the individual applications instead of using the Windows MSI installer package, be sure to download the PuTTYgen application since it is needed to generate the SSH keys.

1. Open the PuTTYgen application.
2. For the Type of key to generate, choose SSH-2 RSA.
3. Click the Generate button.
4. Move your mouse around the area of the progress bar. When the bar is full, the SSH key will be generated.
5. Click the Save private key button to save a copy of the generated private key. If a warning is displayed about saving the private key without a passphrase, choose Yes. Currently, the Carolina CloudApps platform does not support private keys without passphrases.
6. Click the Conversions menu and choose Export OpenSSH key to save a copy of the generated private key in the PEM format. Again, if you see a warning about saving the key without a passphrase, choose Yes.
7. Note: Step 5 above, “Save private key” is to save it in the PuTTY format, and step 6, “Export OpenSSH key”, is to save the private key in a format (PEM) that can be used with Carolina CloudApps.
8. Right-click in the text field labeled Public key for pasting into OpenSSH authorized_keys file and choose Select All. Then, right-click in the same field and choose Copy.
9. Open a text editor, such as Notepad, and paste the copied public key into a new document. Save the public key somewhere as a plain text file.
10. One you have saved your SSH keys, you can close the PuTTYgen application.

Using Git Bash

If you have the Git for Windows command-line tool installed, you can use the Git Bash application to create your SSH keys.

1. Open the Git Bash application.
2. Run the following command:
   ```bash
   ssh-keygen -t rsa -b 4096 -N '' -f /users/myusername/cloudapps_rsa
   ```
   In the above example, replace `/users/myusername/cloudapps_rsa` with the location on the local computer where you want to save the SSH keys. This will create two files: `cloudapps_rsa` (the private key) and `cloudapps_rsa.pub` (the public key).
CUSTOMER CHALLENGES
INTERNAL CHALLENGES

Adoption rate

The challenge:

- Rapid adoption rate
- Large amount of students at the same time in workshops
- Infrastructure scaling
- Limited personnel resources
INTERNAL CHALLENGES
Adoption rate

The solution:

- Students! Specifically, hiring them
- Creating applications and revising workshops
- Created custom templates and images for common use cases
- Idling
INTERNAL CHALLENGES

Customer support

The challenge:

- Becoming the first point of contact
- Repeat questions every semester
- Requests outside the norm...
  - Statistical computing and graphics using R and Shiny
  - Scraping content from public websites using Python
  - Integrating with our research cluster for compute power
INTERNAL CHALLENGES

Customer support

*The solution:*

- Teaming up with other campus organizations to lead workshops and training
- Encouraging and emphasizing self help
- Collaborative chat tools
- For the unique use-cases and exceptional difficulties
  - Face to face meetings
  - Guidance on custom dockerfiles
  - Creating templates/images if needed
- And, of course....hiring students!
USE CASES
A managed platform for developing and deploying web applications
Protesters want UNC to put its money where its art is
© April 28, 2018

University researchers try to generate pickle power
© April 28, 2018

UNC Health Care's proposed merger with Charlotte-based Atrium Health has been called off. Local police are warning motorists about a string of catalytic converter thefts. UNC posted highway signs around the state celebrating last year's men's basketball championship, but not everybody was excited about it. A Chapel Hill fast food place wants to add a drive-through window, but some worry that will spoil the character of Franklin Street. Duke students talk about the chaos that surrounds getting tickets for the UNC basketball game.
**The Prospect of Designer Babies: Is It Inevitable?**

Michael Catalano

It might seem like an abstract idea to many, but we may soon be capable of selecting the traits of unborn children. There have been numerous ethical approaches to the issue, with potential benefits and harms outlined, but few scholars have really looked into the great potential for its development.

**Dancing and Cerebral Health**

Noah Creese

My paper discusses how the human body can treat itself from disease and other ills through dancing. This information is vital as the baby boom generation enters an age associated with heightened risk of dementia, according to the Alzheimer's Association.

**Our Food Insecurity: The Overuse of Antibiotics in Hog Production**

Melanie Moore

In the current era, pigs in the U.S. are raised with antibiotics. According to research, all antibiotics given to livestock to aid growth are supplied by McKenze, Sa.

**Libya and the International Criminal**

Emma Smith

The recent civil war in Libya has caused significant loss of life and displacement. The International Criminal Court has opened investigations into alleged war crimes.

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**Submitting an Article**

If you wish to submit an article for potential publication in the PIT Journal, there are two options:

1. If you have already submitted a conference proposal, you will find your proposal from the list of Proposals for Review or by clicking on My Stuff, and then My Posts. Once you have your initial proposal open, select the Edit button.

2. If you have not yet submitted a conference proposal, you will find the link directly below the Username and Password text boxes titled, “Create new account.”
Population Simulations for Introductory Ecology

Lotka-Volterra Competition  Single population growth

Population Parameters

<table>
<thead>
<tr>
<th>Population 1:</th>
<th>Population 2:</th>
<th>Run time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting population size, $N_i(0)$:</td>
<td>Starting population size, $N_j(0)$:</td>
<td>Number of generations to run:</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intrinsic growth rate, $r_i$:</th>
<th>Intrinsic growth rate, $r_j$:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carrying capacity, $K_i$:</th>
<th>Competition coefficient, $\alpha_{ij}$:</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Update graphs

Population trajectories

Population sizes over time

- Population 1
- Population 2

Phase plane with combined trajectory

- Combined trajectory over time
- Population 1 isocline
- Population 2 isocline

Developed by Audrey L. Kelly
THANK YOU

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youtube.com/user/RedHatVideos
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