Remote Unix Lab Environment (RULE)

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Introducing RULE

RULE provides an alternative way to teach Unix

- Increase student exposure to Unix
- Do it cost effectively
Why Teach Unix?

- Server operating system of choice
  - Unix is the most common OS for Apache web server, the most popular web server in the world
  - Unix is incredibly reliable, according to Netcraft.com the 50 machines with the longest period between reboots are all some flavour of Unix
  - Unix is typically very strong in network centric installations

Why Teach Unix?

- Embedded applications
  - Unix (in particular Linux) has become quite popular in embedded applications such as wireless routers and VPN gateways

- Movement onto the Desktop
  - Brazilian Government switched to Linux earlier this year
  - City of Munich, Germany, also recently switched to Linux
Quality of Education

Of course we would like prepare our students for the real world, through hands-on experience with the tools they will be using when they graduate.

Experience with Unix will be a valuable asset to students when they finish university.

What is RULE?

Traditionally there have been three ways to give students hands-on experience with Unix. In this presentation you will introduced to a new approach ... The Remote Unix Lab Environment (RULE).
Where Does RULE Fit In?

Full Administrator Privileges
1. Dedicated Unix Labs
2. Dual Boot Window/Unix Labs
3. RULE

Restricted User Privileges
4. Remote User Login on Shared Unix Machine

Teaching Unix

- Full Administrator Privileges
  - Teach real system administration, where network services are configured as they would be on a real Unix server and mistakes made as administrator (root) matter
  - Allow students to experience the power and responsibility of configuring and maintaining a Unix installation
    - Configure DNS, Email, Web and Proxy Servers
    - Configure user accounts
    - Monitor and interpret system logs
    - Use network monitoring tools (in a controlled environment)
Teaching Unix?

- Remote User Login on Shared Machine
  - Learn basic Unix commands
  - Configure a web server on a non-standard port in user's home directory?

Clearly to offer your students a real opportunity to learn Unix, you need to make available to them a learning environment as close as possible to what exists in the real world.

A remote user login to a shared Unix machine cannot provide real-world system administration experience.

The Cost of a Full Unix Experience

- Dedicated Unix Labs
  - Dedicated lab space
  - Dedicated Unix machines
  - Difficult for students to maintain system configuration between labs
  - Unix machines can only be used in the lab
  - Scheduling lab time for classes is difficult
The Cost of a Full Unix Experience

- Dual Boot Windows/Unix Labs
  - Requires system administrators capable of maintaining dual-boot machines
  - Unix machines can only be used in the lab
  - Scheduling lab time for classes is difficult

The Cost of a Full Unix Experience

- Remote Unix Lab Environment (RULE)
  - Makes use of preexisting Windows labs
  - Scheduling is simplified as any Windows lab can be used to teach Unix
  - No increase in lab machine system administration
  - Virtual host administration centralized
  - Students' changes to their virtual host are persistent from lab to lab
  - Students can access their virtual host from anywhere on campus or from home (if VPN access is available)
Flexible Unix Education with RULE

- Use Preexisting Windows Labs
  - RULE uses free SSH terminal and file transfer programs on Windows client machines
- Simplify Class Scheduling
  - As RULE can be used from any Windows lab connected to the network, trying to schedule labs with limited specialised resources is no longer a problem
- Flexible Virtual Host Access for Students
  - Students can access their virtual hosts from home (if VPN facilities exist at your institution)

Features of RULE

- For Teaching
  - Lab demonstrators can monitor and control their students quickly and easily through the JHT Administrator application
  - Files required for lab classes can be easily made available to all virtual hosts in a particular class
  - Demonstrators can remotely access students' virtual hosts to assist them
  - As all virtual hosts share the same host operating system, process IDs and log files can be used to detect possible plagiarism
Features of RULE ...

- For Learning
  - Student's experience Unix as if they had administrator rights on their own Unix machine
  - Changes to a student's virtual hosts are persistent between labs
  - Students can access their virtual host from any Windows machine (with appropriate software installed) on the campus LAN or from home (if VPN access is available)
  - No more waiting around for access to limited dedicated Unix machines

The Structure of RULE
RULE Summary

- Flexible Learning
  - Ease class scheduling by making use of common computer resources
  - Allow students full hands-on experience with Unix
  - Simplify system administration, for Unix virtual hosts and Windows lab machines

- Cost Effective
  - No outlay for dedicated Unix lab machines
  - No need for dedicated lab space

Installing RULE

Installing a RULE primary host is a simple process
Insert the installer CD into the primary host machine
Hit Reset
To Install or not to install?
  The RULE installer takes no prisoners, it will wipe the hard disk and install all software required for RULE. Make sure there is nothing on the hard disk that you want to keep.
Installing RULE ...

- Entering Basic Configuration Information
  - Primary Network Adaptor (choose from list)
  - Hostname
  - Domain name
  - IP Address/Netmask
  - Gateway (Default Router)
  - DNS
  - Root Password
  - Non-privileged Username/Password

Using RULE

- Once installation is complete, the machine will reboot
- To start using RULE login via 'ssh' using the default jhtadmin user with X forwarding enabled. Versions of OpenSSH 3.7 and newer will require an additional -Y switch.
  - Ssh -X -C [-Y] -l jhtadmin <ip address of primary host>
- The default password is 'password' this should be changed immediately using the 'passwd' command
- To launch 'JHT Administrator', type jhtadmin
JHT Administrator

- Create classes of virtual hosts
- See host status at a glance
- Boot/Shutdown hosts at the click of a button
- Open a root console directly onto a running virtual host
- Share CD images between virtual hosts
- Change forgotten root passwords

JHT Console Tools

- **jhtboot/jhtshutdown**
  - Boot and shutdown virtual hosts at a given path
  - Mount and unmount disk images as required

- **jhtshare/jhtunshare**
  - Share a resource between hosts below a given path

- **jhtbuildclass**
  - Create a class of virtual hosts for a given IP range at a given path

- **jhtmount/jhtunmount**
  - Mount and unmount virtual host images at a given path
What Next?

- Testing/Bug fixing
- Improved installer (Graphical?)
- More checks (user input, system/jail status)
- Login for admin tools (restricted access)
- Web interface for students to reset virtual hosts
- Web interface for administration
- Cross platform JHT Admin application? ...

Thank you

Questions?