Learning Linux! Labs and more labs!

Speaker name: Richard Weeks
Title: President
Date: 7/26/16
Who is NDG?  www.netdevgroup.com

• Focus: Serving others by helping with job skills
• Mission: Help academic institutions teach IT
• Develop instructional content aligned to jobs
• Working with academia 15+ years
Product 1: NETLAB+ to host real equipment
NETLAB+ software to automate lab use

Time share equipment
NETLAB+ enables hands-on lab

- NETLAB+ product to host lab equipment
- 130,000+ virtual machines worldwide
- 8,500+ Cisco devices worldwide
- Developed cloud platform to host labs
- Hosting Linux courses for learners
3.6 head Command

The purpose of the `head` command is to view the beginning of a file or output. By default, the `head` command will display the first ten lines of a file's contents. For example, the following command displays the first ten lines of the `alpha.txt` file:

```
$ head alpha.txt
A is for Apple
B is for Bear
C is for Cat
D is for Dog
E is for Elephant
F is for Flower
G is for Grass
H is for Happy
I is for Ink
J is for Juice
```

There are several options for the `head` command that are useful. For instance, there is the ability to use a number as an option to indicate how many lines of output to display. For example, to display the first three lines of the `alpha.txt` file execute:

```
$ head -3 alpha.txt
A is for Apple
B is for Bear
C is for Cat
```

There is also an option, `-n`, which takes an argument for the number of lines to display. So, the command `head -n 5 alpha.txt` will display the first five lines of the file.
Linux? Why should learners care?
Linux is part of daily life...
Linux is important base knowledge for IT pros

- Big Data
- Cloud Computing
- Cyber Security
- Networking
- Software developers
SpaceX wants Linux Professionals

“SpaceX is looking for **Software Engineers** .... for our Falcon 9 rocket and Dragon space craft.... We do a majority of our work in C++ on a **custom Linux platform** using a Power PC chip architecture.”

Requirements:

BS or MS or PhD in Computer Science or related field of study

**Extensive knowledge of Linux system programming**
Linux skills are in demand:  www.Indeed.com

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<tr>
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Content with virtual machine for “learn by doing”

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NDG Introduction to Linux
Learn basic Linux system administration skills and prepare for LPI LPIC-1 or CompTIA Linux+ powered by LPI certification.

Course Summary
NDG Introduction to Linux is a 2-course series for aspiring Linux system administrators. Develop proficiency in performing maintenance tasks on the command line, installing and configuring a computer running Linux, and configuring basic networking, using virtual machines running Linux.

- Introduction to Linux I, 70 hours, prepares you for certification Exam 101 and covers: system architecture, Linux installation and package management, GNU and UNIX commands, devices, Linux file systems, and file system hierarchy standards.
- Introduction to Linux II, 70 hours, prepares you for certification Exam 102 and covers: shells, scripting and data management, interfaces and desktops, administrative tasks, essential system services, networking fundamentals, and security.
- Develop a working knowledge of the Linux command line.
- Study with an instructor in the classroom or at your own pace. Access expert content online anytime.
- Get immediate feedback on your knowledge through built-in quizzes and tests.
- Connect with the global Cisco Networking Academy community.

Languages: English
NDG can host too if needed. Prefer Cisco use...
Several content options to help learn and teach Linux

NDG Linux Unhatched
NDG Linux Essentials
NDG Linux 1
NDG Linux 2
## Economical

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<th>Cost to Instructors</th>
<th>Cost to ILT Students</th>
<th>Cost to Self Paced Students</th>
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<td>FREE</td>
<td>FREE</td>
<td>FREE</td>
</tr>
<tr>
<td>NDG Linux Essentials</td>
<td>FREE</td>
<td>FREE</td>
<td>FREE</td>
</tr>
<tr>
<td>NDG Linux I</td>
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<td>$39.95*</td>
<td>$39.95*</td>
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*Paid by the learning institution or the individual student*
NDG Linux Courses
NDG Linux Unhatched

• Covers the basic Linux A+ certification
• Beta version ready for use
• NDG is releasing a new version in August 2016
• Available for learners: Cisco Networking Academy IT Essentials
• Available via the internet from NDG netdevgroup.com/try/unhatched
Free module being built by NDG to teach basics of Linux aligned to A+ certification.
Ready for use: Cisco Networking Academy
Content is Available in IT Essentials Course

Linux and OS X File Systems

Linux and OS X have unique file systems.

The commonly used file systems in Linux are ext3 and ext4 (third and fourth extended file system). They are journaled file systems that keep journals, or logs, of all the changes about to be made to the file system. These journals minimize the risk of file system corruption in the event of a sudden power loss because the journals can be used to apply the changes after power is restored. Both filesystems can support large file sizes up to 32 TiB (tebibytes) for ext4.

HFS+ (Hierarchical File System Plus) is the principle file system used by OS X. Like ext3 and ext4, HFS+ also supports journaled volumes. HFS+ volumes can support large file sizes up to almost 8 EiB (exbibyte) in OS X 10.4 and later.
Beta for Learners and Instructors to Trial
www.netdevgroup.com/try/unhatched
NDG Linux Essentials

• Course designed to make the Linux CLI less intimidating
• Designed to be a Full Semester Course
  • With lectures, content, labs and assessments
• Sixteen (16) Chapters
• Thirteen (13) Lab Exercises
• Assessments
  • Chapter, Midterm and Final
### NDG Linux Essentials Certificate Alignment

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| 2 Open Source Applications and Licenses | 1.2 Major Open Source Applications  
                                          | 1.3 Understanding Open Source Software and Licensing |
| 3 Using Linux     | 1.4 ICT Skills and Working in Linux               |
| 4 Command Line Skills | 2.1 Command Line Basics                           |
| 5 Getting Help    | 2.2 Using the Command Line to Get Help            |
| 6 Working with Files and Directories | 2.3 Using Directories and Listing Files  
<pre><code>                                     | 2.4 Creating, Moving and Deleting Files         |
</code></pre>
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<td>16   Special Permissions, Links and File Locations</td>
<td>5.4 Special Directories and Files</td>
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</table>
NDG Linux Essentials Course Feedback

Student Feedback
- 87% Would Recommend

Instructor Feedback
- 91% Would Recommend
- 100% Plan to Offer
NDG Linux Essentials – Enroll Now
http://www.netacad.com  Linux Essentials
NDG Linux Essentials

Learn the fundamentals of the Linux operating system and command line and basic open source concepts.

Enroll Now
Locale
The term locale refers to a set of parameters that define the user’s language, country and any special variant preferences. These parameters include the following:
- Language
- Numeric representation
- Date-and-time representation
- Monetary units and symbols
- Case conversion - for proper case mapping of characters
- String collation - for determining sort order rules for a country
- Character classification - determines the correct set of characters, digits, punctuation and symbols.

Localization
To serve different cultures, a program should be able to determine its locale and act accordingly. Localization is the process of creating or adapting a product to be suitable for a specific group in terms of language, culture and targeted needs.

There are two methods of providing locale information:
1. Locally run programs use locale information provided by environment variables.
2. Web-based applications use locale information either obtained from the web browser or is explicitly requested as a form value.

Locale Naming Convention
Locale definition files are used to define the language, territory and code set information applicable to the user. Locale definition files use the following naming convention:

```
language_[territory].[code set][modifiers]
```

The same language and territory using the ISO8859–15 code set (the latest Latin alphabet No. 9 including the Euro symbol and other updates) is indicated by `da_DK.ISO8859-15`.

The most common character code set used today is UTF-8 (Universal Character Set + Transformation Format - 8-bit).
3.6 head Command

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```
$ head -3 alpha.txt
A is for Apple
B is for Bear
C is for Cat
```

There is also an option, `-n`, which takes an argument for the number of lines to display. So, the command to display only the first two lines is:

```
$ head -n 2 alpha.txt
A is for Apple
B is for Bear
```
Labs Exercises to Reinforce Skills
NDG Hosts Labs and Virtual Machines

**Step 3**
Change the `LC_NUMERIC` locale variable to `C.UTF-8` by executing the following command:

```
export LC_NUMERIC="C.UTF-8"
```

```bash
sysadmin@localhost:~$ export LC_NUMERIC="C.UTF-8"
```

---

```bash
sysadmin@localhost:~$ locale
LANG=
LANGUAGE=
LC_CTYPE="POSIX"
LC_NUMERIC="POSIX"
LC_TIME="POSIX"
LC_COLLATE="POSIX"
LC_MONOLITHIC="POSIX"
LC_MESSAGES="POSIX"
LC_PAPER="POSIX"
LC_NAME="POSIX"
LC_ADDRESS="POSIX"
LC_TELEPHONE="POSIX"
LC_MEASUREMENT="POSIX"
LC_IDENTIFICATION="POSIX"
LC_ALL=
```

```bash
sysadmin@localhost:~$ locale -a
c
C.UTF-8
POSIX
```

```bash
sysadmin@localhost:~$ export LC_NUMERIC="C.UTF-8"
```
Assessments
Chapter Quizzes, Midterm, Finals

Question 3
A pair of single quotes (') will prevent the shell from interpreting any metacharacter. True or False?

- True
- False

Question 4
A pair of double quotes (" ) will prevent the shell from interpreting any metacharacter. True or False?
Module 3: User and System Administration
Chapter 7: User and Group Accounts

User and Group Accounts

- Linux is a multiuser operating system, allowing multiple users to access the system simultaneously.
- User and group accounts facilitate this by controlling the access allowed for different types of users.
- To execute the commands in this section, root privileges are required.
Before you get started guide to help learners

21.6 Mounting Filesystems Automatically On Boot

Manually mounting filesystems with the `mount` command results in a non-persistent mount. If the system is rebooted, then the `mount` command must be used again. The same is true for activating swap devices with the `swapon` command.

The `/etc/fstab` file is used to configure what filesystems will be mounted automatically at boot. It can also be used to automatically activate swap devices. It may be helpful to think of this file as the filesystem table to remember its name. To those familiar with mounting a filesystem manually the format of the file should make sense.

Root privileges are required to make changes to the `/etc/fstab` file. Any changes made to this file should be performed with care, as mistakes may prevent the system from booting normally.

In fact, it would be an excellent idea to create a backup of the `/etc/fstab` file before making changes. In the event of a disaster, the original file can be restored by copying the backup to the `/etc/fstab` file using a recovery of a live disk. To make a backup copy, as the root user, execute a command like the following:

```
root@localhost:~$ cp /etc/fstab /etc/fstab.backup
```

A system with three filesystem partitions and one swap partition might have an `/etc/fstab` file that looks like the following:

```
# A system with three filesystem partitions and one swap partition might have an /etc/fstab file that looks like the following:
#
# /etc/fstab
# Created by anaconda on Fri Jan 17 10:31:51 2014
# See man pages fstab(5), findifs(8), mount(8) and/or blkid(8) for more info
#
UUID=3dcb6a40-67a2-403d-9c0a-9a901697cd8d / ext4 defaults 1 1
UUID=09d415b5-b5a4-4065-8d80-8ae797dfaf3 /boot ext4 defaults 1 2
UUID=5ee36a5e-c360-4211-a41b-9a4078a804 /home ext4 defaults 1 1
UUID=36813520-63e1-4c78-ba2d-1e952884c9cb swap defaults 0 0
tmpfs /dev/eph tmpfs defaults 0 0
devpts /dev/pts devpts gid=9,node=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
```

Starting system logger: service... bind9 [ OK ] [ OK ]
Starting crond: u 14.04 LTS (GNU/Linux 3.2.0-58-generic x86_64 ) [ OK ]
Generating SHH RSA host key: [ OK ]
Generating SHH RSA host key: p.ubuntu.com/ [ OK ]
Generating SHH RSA host key: [ OK ]
Starting sshd: cloud with the Ubuntu system are free softw [ OK ]
the exact distribution terms for each program are described in the individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.

```
sysadmin@localhost:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos test
sysadmin@localhost:~$ su
Password:
root@localhost:~# bkid
/dev/sda1: LABEL="config-2" TYPE="iso9660"
/dev/sda1: LABEL="mdsod" LABEL="EF1-SYSTEM" UUID="1400-C495" TYPE="vfat"
/dev/sda1: LABEL="USR-A" UID="0c3b7ac-4f3d-499d-bfa0-9ada392aa3ed" SEC_TYPE="e xt2" TYPE="ext4"
/dev/sda6: LABEL="OEM" UUID="515383b3-5f56-4d2c-be87-9b3382a8869e" TYPE="ext4"
/dev/sda9: LABEL="ROOT" UUID="c73b8747-5873-4904-b7a1-2e4938c0a3dd" UUID_SUB="83
```
9.3 Command Mode Actions

The standard convention for editing content with word processors is to use copy, cut, and paste. The vi program has none of these, instead vi uses the following three commands:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Vi</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>cut</td>
<td>d</td>
<td>delete</td>
</tr>
<tr>
<td>copy</td>
<td>y</td>
<td>yank</td>
</tr>
<tr>
<td>paste</td>
<td>P</td>
<td>put</td>
</tr>
</tbody>
</table>

The motions learned from the previous page are used to specify where the action is to take place, always beginning with the present cursor location. Either of the following general formats for action commands is acceptable:

```
action [count] motion
[count] action motion
```

Delete

Delete removes the indicated text from the page and saves it into the buffer, the buffer being the equivalent of the "clipboard" used in Windows or Mac OSX. The following table provides some common usage examples:

```
<table>
<thead>
<tr>
<th>action</th>
<th>motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>delete</td>
<td></td>
</tr>
</tbody>
</table>
```

* Starting domain name service... bind9
Welcome to Ubuntu 14.04 LTS (GNU/Linux 3.13.0-79-generic x86_64)
* Documentation: https://help.ubuntu.com/

The programs included with the Ubuntu system are free software; the exact distribution terms for each program are described in the individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.

This lab has two user accounts (username :: password )

root :: netlab123
sysadmin :: netlab123

Press the [Enter] key to begin...
NDG Linux I course 1 for exam 1 Linux+

- Aligns to CompTIA Linux+ powered by LPI and LPI LPIC-1 (Exam 1 of 2)
- Designed to be a Full Semester Course
  - With lectures, content, labs and assessments
- Higher level of rigor than Linux Essentials
- 27 chapters
- 24 lab exercises
- Assessments
  - Chapter, Midterm and Final
- Languages: English
## NDG Linux I Objective Alignment

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<td>103.1 Work on the command line</td>
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<td>Title of Chapter</td>
<td>Linux Professional Institute LPIC-1 101 Certification Objectives</td>
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<tr>
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<td>------------------------------------------------------------------</td>
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<tr>
<td></td>
<td>104.1 Create partitions and filesystems</td>
</tr>
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<td>21 Mounting Filesystems</td>
<td>102.1 Design hard disk layout</td>
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<td></td>
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</tr>
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</table>
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<tr>
<th>Question</th>
<th>Mean</th>
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</thead>
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<td>Prepare for certification exams?</td>
<td>4.9 out of 5</td>
</tr>
<tr>
<td>Learn skills that can be used in current or future jobs?</td>
<td>4.81 out of 5</td>
</tr>
<tr>
<td>Increase their value in the job market?</td>
<td>4.81 out of 5</td>
</tr>
<tr>
<td>Obtain a new job or advance career?</td>
<td>4.57 out of 5</td>
</tr>
</tbody>
</table>
NDG Linux II course 2 for exam 2 Linux+

- Aligns to CompTIA Linux+ powered by LPI or LPI LPIC-1 (Exam 2 of 2)
- Designed to be a Full Semester Course
  - With lectures, content, labs and assessments
- 19 chapters
- 19 lab exercises
- Assessments
  - Chapter, Midterm and Final
- Languages: English
## NDG Linux II Objective Alignment

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</tr>
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</tr>
<tr>
<td>Title of Chapter</td>
<td>Linux Professional Institute LPIC-1 102 Certification Objectives</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
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GUI Capable Virtual Machines - Demo
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**Quote from Cisco engineer:**
"I finished both NDG Linux I and II courses, and was able to get Linux+ certified as well. These were some of the best self-study training materials I've had, and I would definitely recommend them to others. They give you all the academic, hands-on and test-prep you could want on this subject matter. Very nice work."

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"My team offers train the trainer programs for Cisco Networking Academies. We decided to trial offering Linux training to our instructor community. We have been very happy with the response: We offered the training on Friday. By Monday I had a full class. Response was so good we offered a second class. We now have a wait list."

Kelly Caudle, Stanly Community College, Cisco Networking Academy ASC / ITC
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5 Creating filesystem Quotas
6 Booting and Restarting the System
7a Using the BASH Shell
7b Using the BASH Shell
7c Using the BASH Shell
7d Using the BASH Shell
8 Monitoring Processes
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10a Managing Text Files
10b Managing Text Files
10c Managing Text Files
11a BASH Shell Features
11b BASH Scripting
12 Working with a SQL Database

LAB Set 1

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1 Configuring X Windows in CentOS and Fedora Desktop
2 Accessibility Technologies
3 Users and Group Accounts
4a System Administration Tasks
4b System Administration Tasks
4c System Administration Tasks
5 crontab and at
6 Configuring Locale and Time Zone Settings
7a Working with Email
7b Working with Email
8 Basic Network Configuration
9 Basic Security Administration
10a Securing Data with Encryption
10b Host Security
11a BASH Shell Features
11b BASH Scripting
12 Working with a SQL Database

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