Module 2 - Linux for Robotics

Lesson Objectives:

1. Learn fundamental concepts of Linux as they apply to robotics.
2. Develop basic operational understanding of Linux through application.

Agenda:

1. Lecture
2. ICE2 Jupyter Notebook

1 Lecture.

Operating System vs Kernel: An Operating System is the program that runs on the computer to manage the resources of the system, while the kernel is part of the OS and provides the bridge between the software and hardware.

Linux (`https://en.wikipedia.org/wiki/Linux`): "Linux is a family of open source Unix-like operating systems based on the Linux Kernel." Some examples of Linux operating systems include Ubuntu, Debian, Raspbian, Kali, etc. Windows 10 is an operating system and uses Windows-NT as their Kernel. Apple computers use MacOS as their operating system and are based off a Unix Kernel.

A lot of researchers use Linux based operating systems because of the open-source community support.

File Commands:

File Commands	
ls	directory listing
ls -al	formatted listing with hidden files
cd *dir*	change directory to *dir*
cd	change directory to home
pwd	show current director
mkdir *dir*	create a directory *dir*
rm *file*	delete *file*
rm -r *dir*	delete directory *dir*
cp *file1 file2*	copy *file1* to *file2*
mv *file1 file2*	rename or move *file1* to *file2*
touch *file*	create or update *file*
chmod +x *file*	add execute permissions to *file*
cat *file*	displays contents of *file*

Network/SSH/SCP:

Network/SSH/SCP	
ping *host*	test connectivity to *host*
ssh *user@host*	connect to *host* as *user*
scp *file user@host:file*	copy file to remote host file location

Searching:

Searching	
grep *pattern files*	search for *pattern* in *files*
grep –r *pattern dir*	search recursively for *pattern* in *dir*
command | grep *pattern*	search for *pattern* in output of *command*

Process management:

Process Management	
ps -aux	display currently active processes
kill *pid*	kill process id *pid*
killall *proc*	kill all processes named *proc*

Shortcuts:

Shortcuts	
Ctrl+c	halts the current command
Ctrl+z	stops the current command
Ctrl+d	log out of current session
Ctrl+u	erases the whole line
Ctrl+r	type to bring up recent command
!!	repeats the last command
exit	log out of current session
up-arrow	scroll previous commands

File permissions:

File Permissions	
chmod *octal file*	change the permissions of the *file* to *octal, which can be found separately for user, group, and world by adding:* *4 - read (r)* *2 - write (w)* *1 - execute (x)* *Examples:* *chmod 777 - r,w,x for all* *chmod 755 - rwx for owner, rx for group and world* *chmod +x - add execute for user*

System:

System	
sudo	run command as root
sudo apt install *program*	install *program*
sudo apt update	update list of available packages
sudo apt upgrade	installs newer versions of packages
uname –r	show kernel info
cat /etc/os-release	show os version
sudo reboot	reboots system

2 ICE2 Jupyter Notebook.

The ICE2 Jupyter Notebook will help you practice implementing some of the discussed Linux commands.

1. On the master, open the Jupyter Notebook server (if it is not already open):

```
dfec@master:~$ roscd usafabot_curriculum/Module2_Linux
dfec@master:~$ jupyter-notebook
```

2. Open the ICE2 Jupyter Notebook, "ICE2_Linux.ipynb" and follow the instructions within the notebook.

Checkpoint. Take a screenshot or show the instructor the following:

1. The output of each of the code blocks within the `ROS` section of the "ICE2_Linux.ipynb" notebook.

3 Assignments.

☐ Complete Jupyter Notebook if not accomplished during class.

4 Next time.

- **Lesson 5** - Quiz and ICE 2