

# Orientation 2018



### Paul Henderson

Director of Research Support

### **Kevin Miles**

Systems Engineer

**Rick Stillings** 

**Essex Scales** 

Systems Engineer

Systems Engineer



### What we do

- Support department research
- Build servers and clusters
- Manage infrastructure
- Helpdesk support

### How to get in touch

Contact us via

cshelpdesk@virginia.edu

Find more information

https://cs.virginia.edu/wiki



### What we don't do

- Email accounts
- Mailing lists
- Netbadge

Who Does?

ITS

4help@virginia.edu

Find more information

https://its.virginia.edu/helpdesk



### What else we don't do

### Who Does?

- Phones
- Department mailing lists
- Environment requests (AC, heating, etc.)
- Facilities requests
- Room (swipe) access

CS Office Staff

#### cs-office@virginia.edu



### Help Desk Tickets

- Email sent to cshelpdesk@virginia.edu will generate support ticket
- Should receive auto-response and ticket number in the subject line
- Tickets help us track support requests
- Reply to original email thread
- Don't modify subject line



### Accounts



### **CS** Account

- Different from ITS/NetBadge account
- Allows login to department resources
- User accounts come with file storage
- Web hosting space associated with account

### Accounts



### **CS** Domain

- New one password for everything CS
  - $\circ$  ~ No longer separate passwords for Windows vs. Linux
- Account and file storage will expire when you leave
- Files owned by expired accounts will **not be kept**





- CS has its own network apart from ITS
- Layer 2 network
- 1Gb/s connection at each desk
- Growing 10Gb/s network
- Public IP addresses
  - CS has 6 class C subnets



- Network clients must be registered
- Clients can be registered by request
- CS has no wireless network
  - $\circ \quad \mbox{Wireless clients should connect to ITS WiFi}$
- Unauthorized clients will be found and blocked without notice

### DHCP

- Clients must register device MAC Address
- Requests for new devices must come from faculty





### DNS

- Authority for cs.virginia.edu domain space
- Hosts are in cs zone
  - A computer/server named power2 has FQDN power2.cs.virginia.edu
- Names and aliases may be requested by faculty



- ITS blocks certain types of traffic
  - Samba
  - Windows Remote Desktop
- ITS watches network traffic looking for
  - Botnets
  - Malware activity
  - $\circ$  Torrents
  - Spam
- Flagged traffic can result in Abuse Ticket
- New firewall in CS





Absolutely no wireless access points!

# **Operating Systems**

# **Operating Systems**

- All major operating systems found in CS
- Official support for
  - CentOS 7.5
  - Ubuntu 18.04
  - Windows 7, 10
  - Mac OS X
- Desktop systems come dual-boot Windows/Linux





### Linux

- Main research platform
- CentOS on server systems
- Ubuntu on desktop systems



### Linux

### Software

- Common software available as Modules
- Smaller packages (libraries, dependencies, etc) installed through OS packages



### Linux

### Modules

- Modules allow multiple versions of same software to co-exist without affecting each other
- Software is located in /sw
- Mounted over NFS & available everywhere



### Linux - Modules

#### View software with module avail

Load a module with module load

ktm5j@porta103 ~ \$ module avail

	/sw/centos/Modules/modulefiles			
altera_pro	cudnn-7.0.5	java9	php7.1.10	
anaconda3	cudnn-7.1.1	java9.0.4	python	
atom	doxygen	lua	python3	
boost	eclipse	lua-5.3.4	python3.6.2	
boost-1.67.0	emacs	matlab	qsys	
clang-llvm	fio	modelsim_ae	quartus	
clang-llvm-6.0.0	gcc	modelsim_ase	ruby	
cmake	gcc-6.3.0	nios2eds	ruby2.5.1	
cmake-3.10	gcc-7.1.0	perl	storm	
cuda—toolkit	gdb-8.1	per1-5.26	vscode	
cuda-toolkit-8.0	java	perl-6		
cuda-toolkit-9.0	java8	php		
cudnn	java8u161	php7		

-----Modules/modulefiles -

apktool tmux tmux-2.7 **ktm5j@porta103** ~ \$ module load java9 **ktm5j@porta103** ~ \$ which java /sw/centos/java/9.0.4/bin/java **ktm5j@porta103** ~ \$



### Windows

- Desktop systems come with Windows 7 or Windows 10
- Systems joined to CSDOM domain
- Users can be added to local admin group **once they return signed policy agreement**
- Windows 7 systems use Symantec
- Windows 10 systems use Windows Defender



## Mac OS

- Mac systems are ad-hoc
- Not joined to domain
- Not set up for NFS
- Can use samba to mount home directory
- Use samba to print



File Servers - SAN Configuration



- 8Gb/s SAN network
- ~1PB of disk space in CS
- All partitions now ZFS
- Snapshots every 6 h
- Off-site backups



File Servers - Ethernet connected to off-site backup location



File Servers - Storage configuration mirrored at backup site



#### ZFS

- Dynamic partitions
  - Storage can be hot-added or removed
  - Partitions can be moved easily
- Snapshots
  - Exact copy of partition
  - Window into past
  - Easy to interact with



### **Home Directories**

- Network storage mounted on all Linux systems
  - Home directory available everywhere
  - $\circ$  Mounted in /
- Historically home directories organized by partition
- Partitions are associated with faculty member
- Old partitions named zf1-zf25
- Very old partitions named af\* or uf\*



### **Network Access**

- Department computers pre-configured
- Linux systems have all partitions mounted via NFS
- Windows desktop systems mount home directory to K: \ drive
- NFS restricted to UVA networks & authorized clients

Personal Devices & Outside CS

- Samba/CIFS can be used
- Must be inside UVA network or on VPN



### Samba/CIFS

We have a new central samba server:

\\samba.cs.virginia.edu\username

- One address for everyone
- Authenticate with CS credentials



#### New Storage - /u and /p

- Additional 300TB added to SAN
- New /u and /p partitions
  - $\circ$  /u user home directories
  - /p project directories



#### /u - Home Directories

- New accounts
- Each home directory as its own ZFS dataset
- 20GB quota

#### /p - Project Directories

- Project space
- Better place for data
- Group owned
- Can be tweaked for performance



#### /bigtemp

- Large 70TB volume
- Used for storing large datasets
- Scratch space
- Not backed up
- Files may be deleted after period of time



### **Backups and Snapshots**

- Snapshots taken every 6 hours (4x per day)
- Snapshots immediately transferred to off-site
- Typically kept for 30 days

#### **Snapshot Quirks**

- Because of snapshots, deleting files does not recover space
- Space only recovered once snapshot eventually deleted
- Full ZFS datasets will require admin intervention



- Every account gets web space under www.cs.virginia.edu domain
- Server runs PHP
  - $\circ \quad \text{With DB connectors} \\$
- DB accounts are requestable



Content for each user-site is found in home directory

~/public\_html/

URL format

https://www.cs.virginia.edu/~username

Content for each user-site is found in their home directory

#### ~/public\_html/



#### Example - Mozilla Firefox (Private B × Example + CO www.cs.virginia.edu/~ktm5j/example/ **Hello World** Terminal File Edit View Search Terminal Help ktm5j@applecake 🛚 💲 pwd /u/ktm5j ktm5j@applecake ~ \$ cd public\_html/ ktm5j@applecake ~/public\_html \$ cat index.html <html> <title>Example</title> </head> <body> <h1>Hello World</h1> </head> </html> ktm5j@applecake ~/public\_html \$



### Printing

- Printing available at no cost
- Two print servers
  - Windows print server
  - CUPS Unix print server
- Poster printing available



### **Poster Printing**

- Poster printing available upon request
- Request for poster printing must be sent to cshelpdesk@virginia.edu
- Poster requests must be submitted with **48 hours notice**



### **Loaner Laptops**

Lenovo loaner laptops are available for students

- Request must be made by faculty
- Short term, typically 2 weeks or less
- Period can be extended with approval



### **CS** Office

The following requests are handled by admin staff and should be sent to **cs-office@virginia.edu** 

- CS department mailing lists (cs-faculty, cs-grads etc.)
- Room (swipe) access
- Conference room scheduling



- Many clusters in CS
- SLURM used for scheduler
- GPUs
- FPGAs
- Infiniband



### SLURM (Simple Linux Utility for Resource Management)

- Workload manager for 60% of TOP500 clusters
- Allocates resources to clients
- Jobs can be submitted from power nodes (power [1-6])

```
ktm5j@power3 ~ $ srun -w slurm[1-5] hostname
slurm3.cs.virginia.edu
slurm1.cs.virginia.edu
slurm5.cs.virginia.edu
slurm2.cs.virginia.edu
slurm4.cs.virginia.edu
```

### **SLURM Nodes**

Hostname	Count	GPUs	Memory (GB)	СРИ Туре	CPUs	Sockets	Cores/Socket	Threads/Core
hermes[1-4]	4		256	AMD	64	4	8	2
artemis[1-7]	7	1	128	AMD	32	2	8	2
slurm[1-5]	5		512	Intel	24	1	12	2
falcon[1-10]	10		128	Intel	24	1	12	2
nibbler[1-4]	4		64	Intel	20	1	10	2
trillian[1-3]	3		256	AMD	64	4	8	2
granger[1-6]	6		64	Intel	40	2	10	2
granger[7-8]	2		64	Intel	16	2	4	2
ai0[1-6]	6	4	64	Intel	32	2	8	2
lynx[01-12]	12	4	64	Intel	32	4	8	2
affogato[01-15]	15		128	Intel	16	1	8	2

# gpusrv Nodes

Hostname	GPUs	Memory (GB)	СРИ Туре	CPUs	Sockets	Cores/ Socket	Threads/ Core
gpusrv1	2	32	Intel	12	1	6	2
gpusrv2	2	64	Intel	12	1	6	2
gpusrv3	2	64	Intel	12	1	6	2
gpusrv4	2	64	Intel	12	1	6	2
gpusrv5	2	64	Intel	8	1	4	2
gpusrv6	2	64	Intel	8	1	4	2



### **SLURM Nodes**

- >2000 cores in SLURM
- Almost 10TB Memory
- 50 GPUs

### **Power Nodes**

- power[1-6]
- 96 cores
- 576 GB Memory

### **Gpusrv Nodes**

- 64 cores
- 352 GB Memory
- 12 GPUs



### Takeaways

- CS vs. ITS
- Lots of computing power
- Lots of storage
- Be mindful
- cshelpdesk@virginia.edu

