Welcome to Systems Security (SysSec)

UBNetDef, Fall 2021
Week 1
Lead Presenter: Radhika Jois
Special Thanks: Phil Fox

Agenda - Week 1

1. Welcome
    1.1. Introductions
    1.2. Opening remarks
    1.3. Ground rules
2. Overview
3. Virtualization
    3.1. In Class exercise: Go Virtualize
4. Coursework
    4.1. Workflow
    4.2. Support
    4.3. Reporting
    4.4. Topology
    4.5. Field Trip: Data Center
    4.6. Assignment: Homework 1
        4.6.1. In class exercise: Launch a new Virtual Machine (VM) from .iso
5. Summary/Wrap-up

Mattermost

Introductions

UB SecDev, Fall 2021

Radhika Jois **(@radhikaj)** - SecDev Lead, White Team Lead, CCDC

Anthony Magrene **(@magrene)** - Lockdown Red Team Lead, CCDC, CPTC

Vasudev Baldwa **(@vasudevb)** - Infrastructure/Lockdown Black Team Lead, CCDC, CPTC

Lucas Crassidis **(@luke)** - Lockdown Red Team, CCDC, CPTC

Anthony JeanPierre **(@ant)** - SecDev Member

Introductions

UB NetDef Faculty

Prof. David J. Murray (@djmurray)

Prof. Kevin Cleary (@cleary.kevin.p)

UB SecDev Alumni Volunteers

Prof. Dominic Sellitto (@dsellitto)

Stephen James (@stephenorjames)

Aaron Fiebelkorn (@aaron)

Nick Brase (@nickbrase)

Jay Chen (@jay_c)

Chris Klimek (@chrisklimek)

Shreya Lakhkar (@shreya)

Phil Fox (@xphilfox)

UB SecDev Student Volunteer Staff

Rashid Abubeker (@riabubek)

John Ryan (@jpryan2)

Malav Vyas (@malavvyas)

Edward Lynch (@edwardly)

*Indicates a F21 lead instructor role

Opening Remarks

Featuring Prof. Murray

UBNetDef Goals:

Learn, Have Fun, Be Your Best

Ground Rules

- Lectures: Recorded for archive (starting now!)
- Attendance: Taken weekly during lecture time. IT IS PART OF YOUR GRADE!!
- Homework: Weekly, deliverables due Thursdays 7:04(:59) pm
- Late Policy: Everything submitted on time!
- COVID: Follow all guidelines put forward by the University and SUNY

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Overview - What is UBNetDef?

It’s an organization!

We host:

- Camps
- Competitions
- Courses

As:

- Faculty
- Students (grad and undergrad)
- Alumni and volunteers

Overview - What are UBNetDef roles?

All sorts!

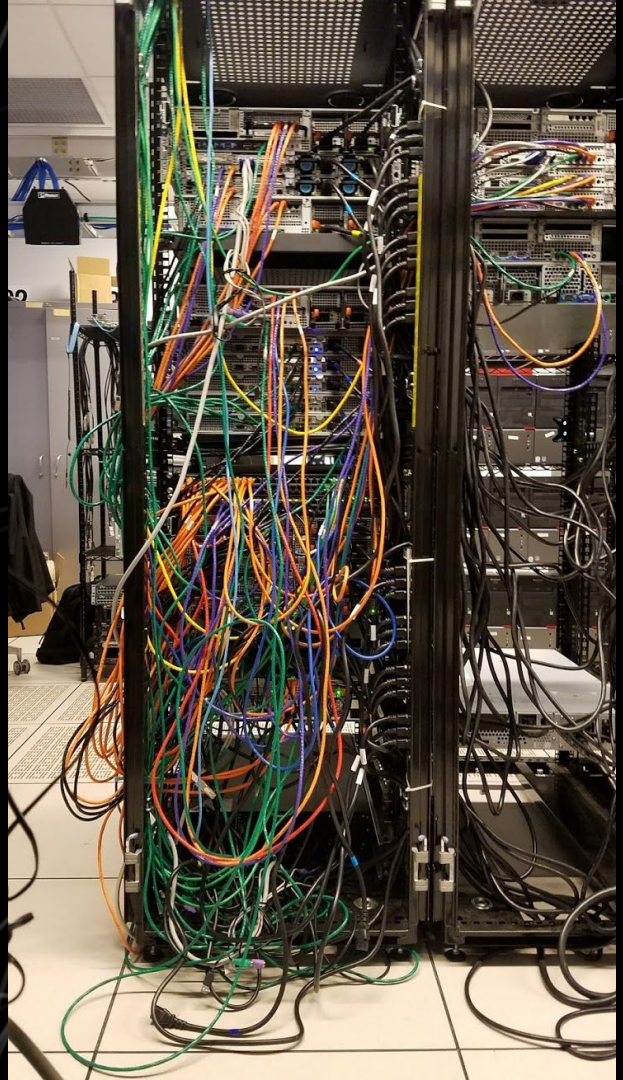
- Learners
- Curriculum development
- Course instruction
- UB team competitors
- Infrastructure maintenance and management
- Mentorship and advising
- Administration (this is mostly Prof. Murray)

Overview - UBNetDef Learners

The (for-credit!) courses

- SysSec: The gateway
- Network Security (NetSec)
  - Linux software and networking deep dive
  - Packet analysis
- Scripting Security (`Phil` will always call this 'ScripSec' whether it catches on or not)
  - Bash programming
  - Security project
- Security Development (SecDev)
  - Course and curriculum development/instruction
  - Infrastructure management (behind the scenes preview next!)

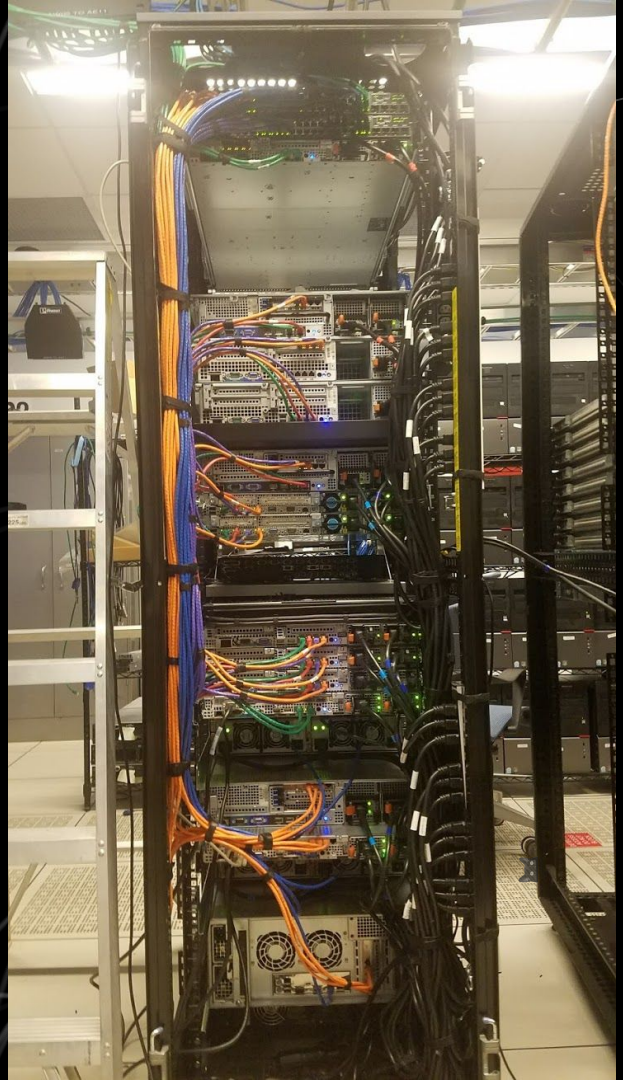
An MBA and two CSE students walk into a server room…

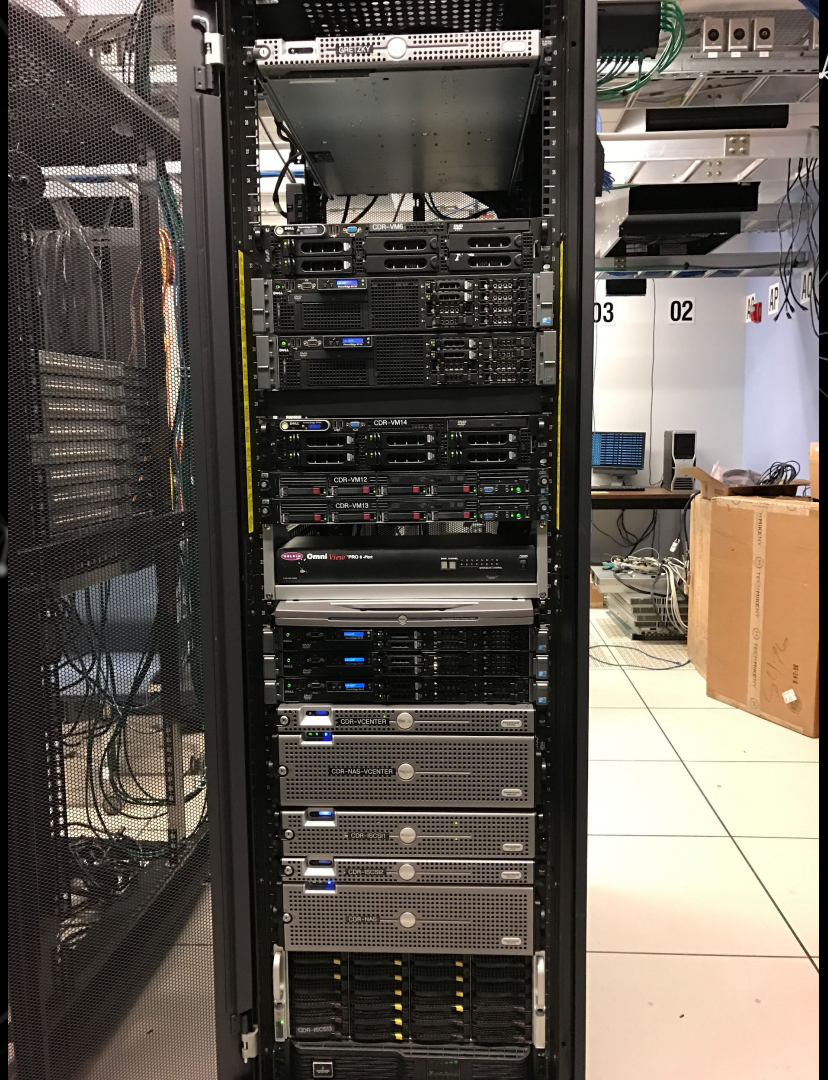


#WorkingTogether

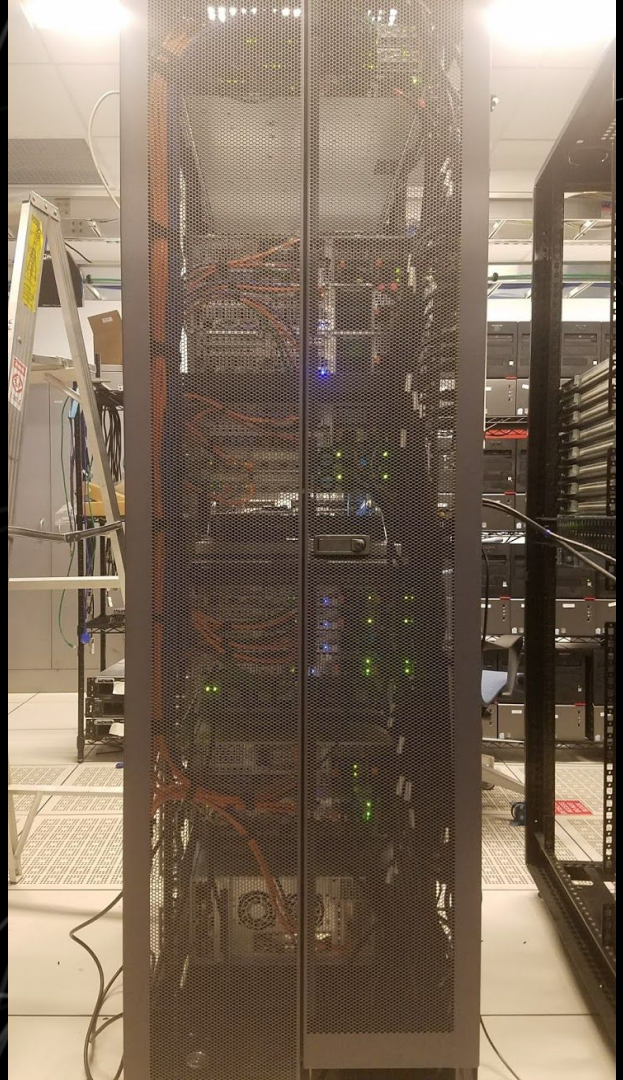

SECURITY


04




CDR-VM6
CDR-VM14
CDR-VM12
CDR-VM13
Omni View PRO 8-Port
CDR-VCENTER
CDR-NAS-VCENTER
03
02

THE DOORS CAN CLOSE!!!

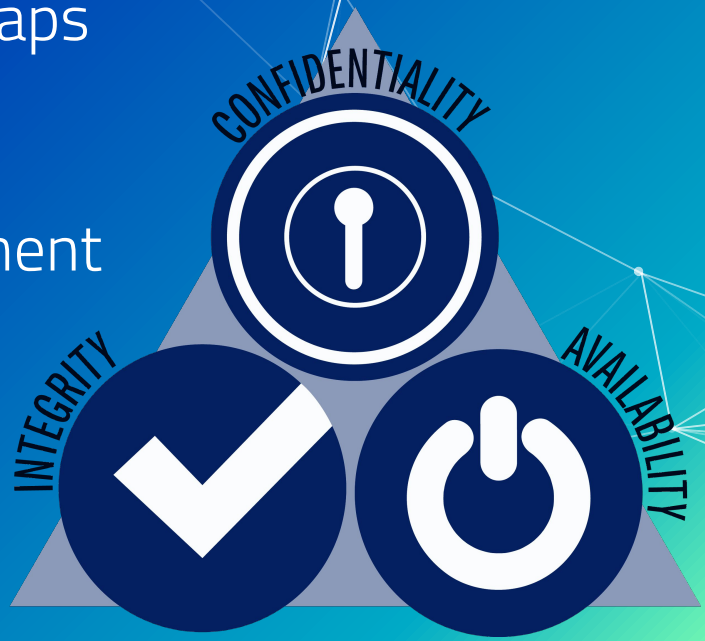


BOTH OF THEM!!!!

Overview - SysSec

What about *this* course?

- Investigating the boundaries and overlaps between:
  - Information Technology (IT)
  - Information Systems (IS) Management
  - Computer Hardware and Software
- ...through the lens of “cybersecurity”
  - Observe: The “cybersecurity triad”

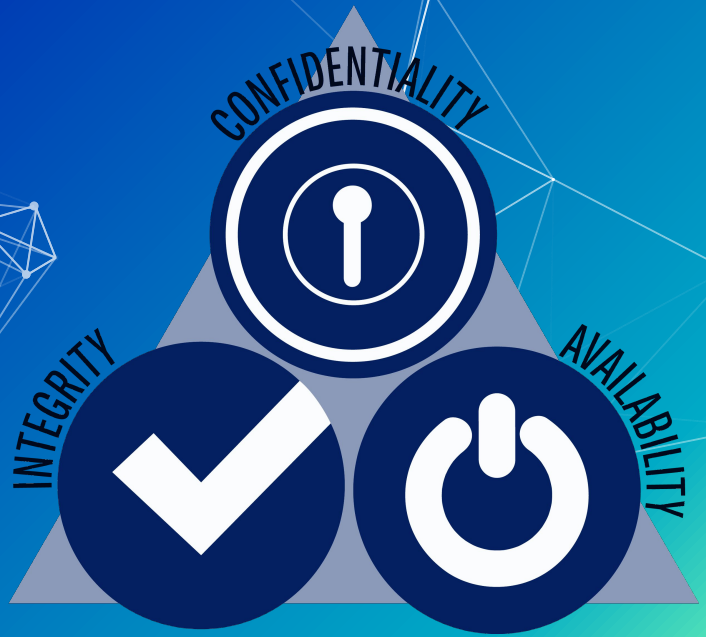


Overview - Cybersecurity

Discussion (roundtable):

What's the difference?

- Confidentiality
- Availability
- Integrity



Overview - Cybersecurity

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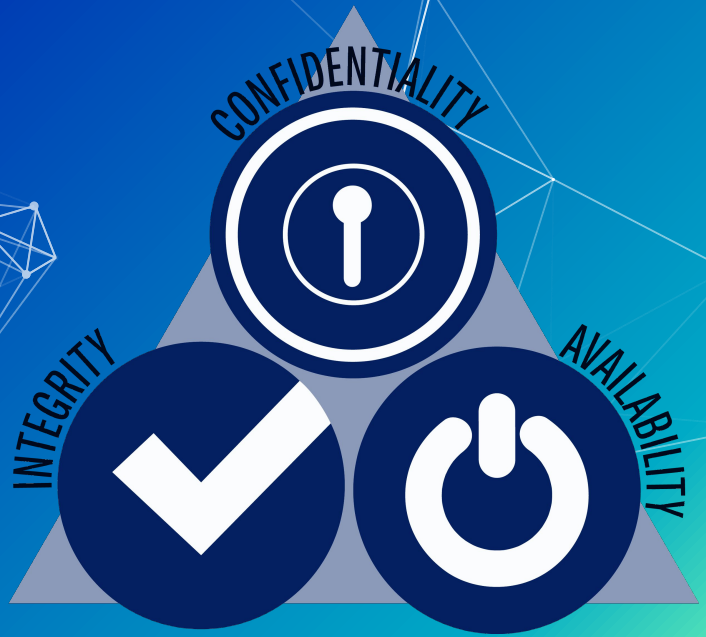
Which is most important?



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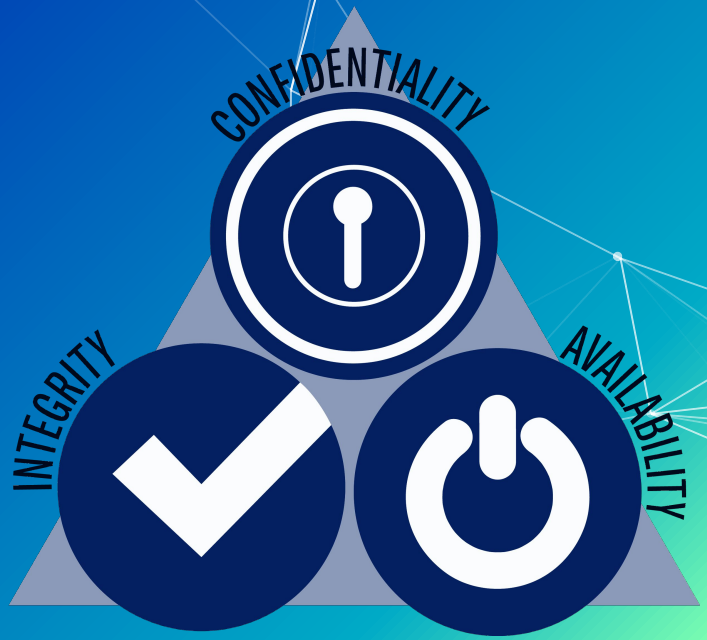
Can priorities between the three change?



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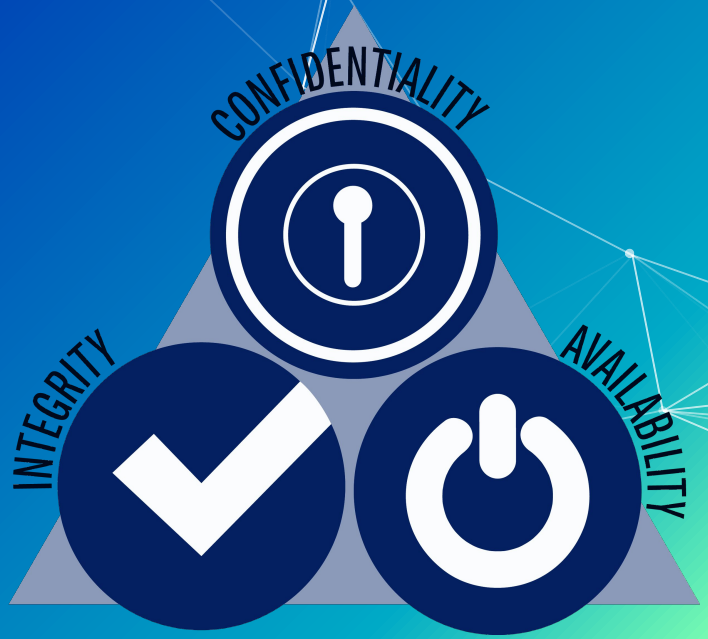
Challenge: Subdivide one pillar



Overview - Cybersecurity Roles

Discussion (roundtable):

Who does what?

- Executives
- Managers
- Evaluators
  - E.g, consultants, analysts, auditors, testers
- Technicians
- Programmers/Developers
- Educators

Overview - Cybersecurity Components

- Computer/controller software
- Network
  - Wireless
- Algorithmic/cryptographic
- Computer/controller hardware
- Physical
- Governance
- Others?

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An analogous scenario: Zoom outage!

You are in the middle of a Zoom call and it disconnects

Discuss (roundtable): What do you do?

An analogous scenario: A class on Zoom outages

Good. You are clearly experts…

…so much so that you will instruct the class: MIS 099/My Internet Is Down

We have to develop the syllabus, namely the required course materials!

Discuss: What will students need for their remote labs?

An analogous scenario: A class on Zoom outages

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Discuss: What will students need for their remote labs?

Discuss: (About) how much would that cost?

An analogous scenario: A class on Zoom outages

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We have to develop the syllabus, namely the required course materials!

Discuss: What will students need for their remote labs?

Discuss: (About) how much would that cost?

Discuss: Knowing what we now know, would *anybody* take our class?

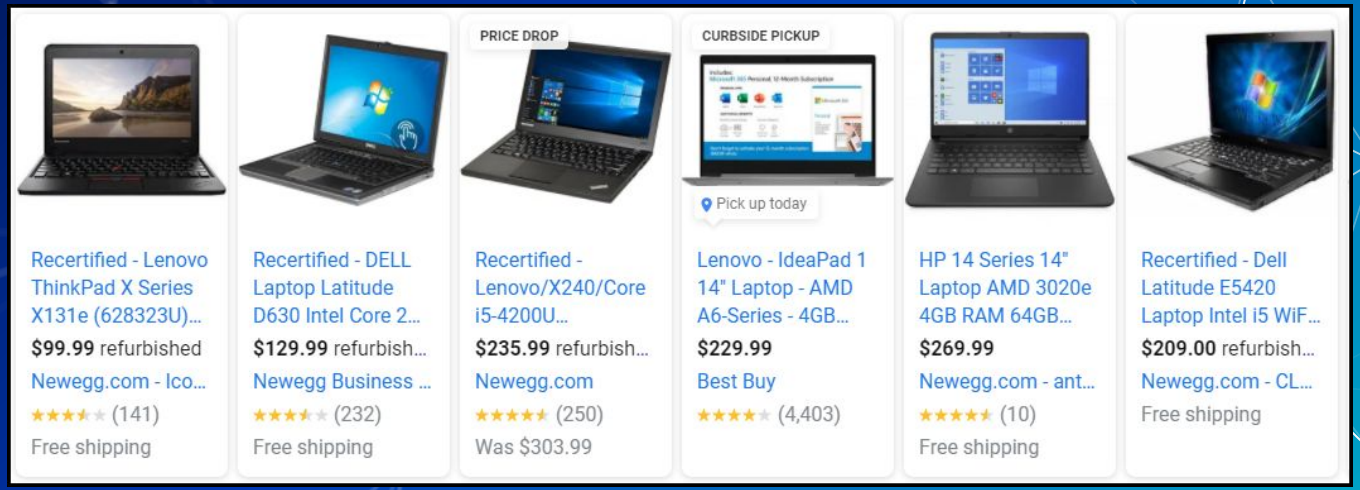
An analogous scenario: Course materials

Now, imagine that we (SecDev) actually forgot to put the required materials for this class on the syllabus. Here's what we're looking at:

Good enough internet: **$85**+/mo.
Uptime (electric): ~**$20**/mo.
Cooling (electric): ~**$20**/mo.

An analogous scenario: Course materials

Additional clients (3):



An analogous scenario: Course materials

Windows 10 and Server licensing:

An analogous scenario: Course materials

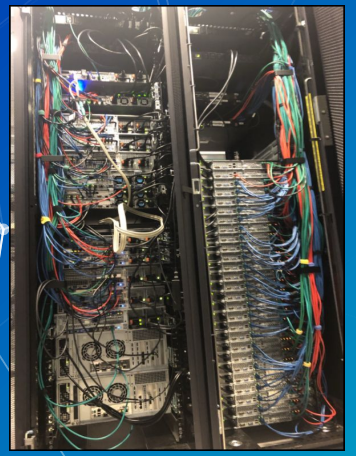
Webservers (3):

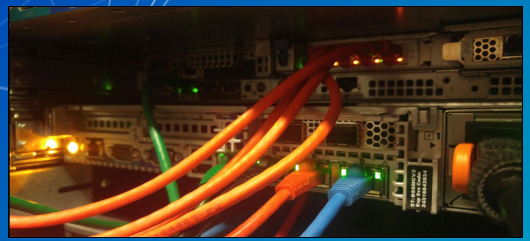
An analogous scenario: UBNetDef resources

As it turns out, UBNetDef has you *all* covered already. (Whew!)

We have these:

… and all you have to do is drive over to Davis Hall and pick your gear up.





Converging the analog: Virtualization

Instead, we're going to get you the resources you need for this class through virtualization!

- Remote access to all kinds of different computing solutions
- No need for your own hardware *or software*
  - Not even a VirtualBox download (for those of you with experience)!
- Effective 24/7 access
- UB and program donors foot the bill!
  - No small expenditure, as you observe

Virtualization: Let's look inside

- Login to VPN
- Login to vCenter
  - Primary course links available at https://ubnetdef.org/courses/syssec/
    - Also available on UBLearns!
  - vCenter: http://cdr-vcenter.cse.buffalo.edu/
  - Use your full UB email for the login ID

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  - Favorite/Bookmark vCenter!

Breakout 01

Login to vCenter

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  - vCenter: http://cdr-vcenter.cse.buffalo.edu/
  - Use your full UB email for the login ID
- Check it out: You have a device!

Breakout 02

Virtualization Activity

Virtualization Activity

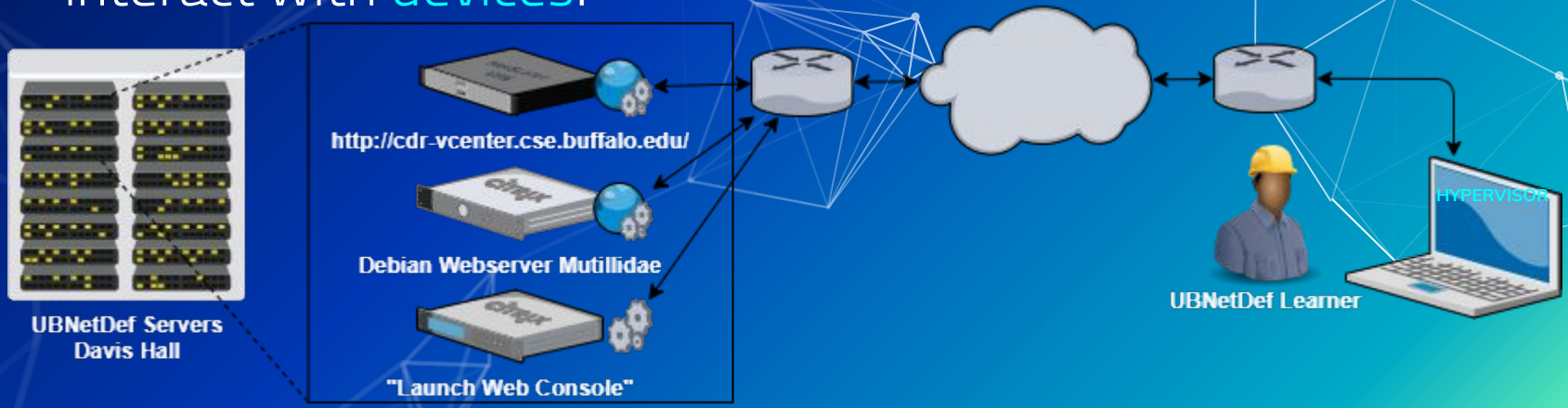
- Windows
  - Open your Windows VM
  - Try to use it. What do you observe?
  - And now, we will increase it to 8 GB of RAM
  - What do you observe?

Virtualization Activity

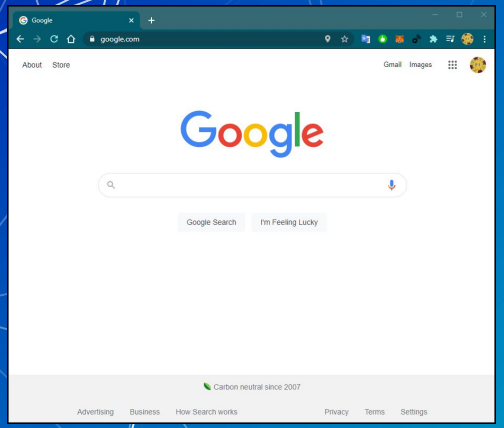
- Linux
  - Open your Kali VMs
  - Start hashcat
    - hashcat -h
  - Try to crack the passwords in the first file!
    - hashcat -m 0 -a 0 -o cracked.txt targetedHashesEasy.txt /usr/share/wordlists/rockyou.txt
    - hashcat -m 0 -a 0 -o cracked1.txt targetHashes10.txt /usr/share/wordlists/rockyou.txt
  - Try to crack the passwords in the second file
  - What do you observe?

Back to virtualization: How did we do that?

- Servers serving services!
- Not just webpages, but entire devices!
- Not just entire devices, but a hypervisor that lets learners interact with devices!

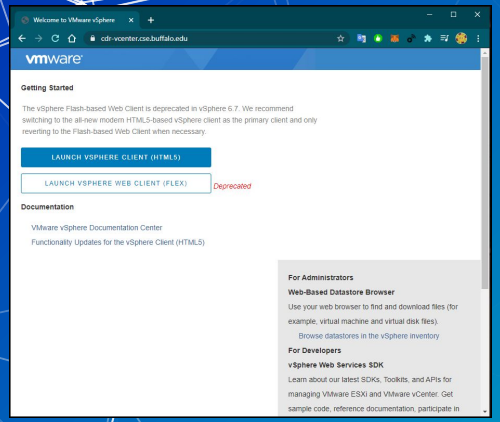


Virtualization: What (you) the end user sees



- **Host machine launches a browser**
- The browser GETs the vCenter webpage
- The vCenter webpage lists virtual devices
- The vCenter webpage launches a hypervisor
- The hypervisor allows end users to interact:
  - Using the host I/O (monitor, mouse, keyboard)
  - Through the browser (web)
  - To the console of a virtual device!

Virtualization: What the end user sees



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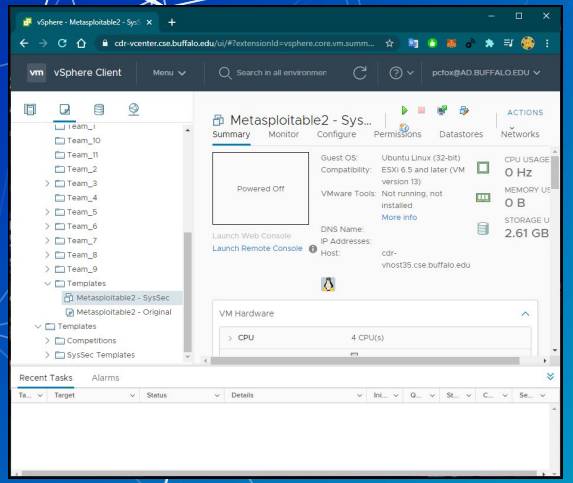

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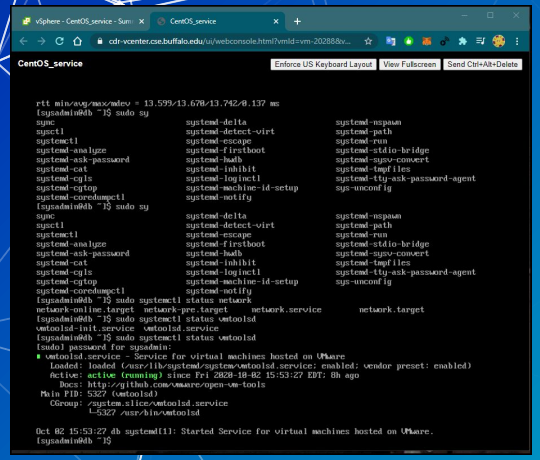

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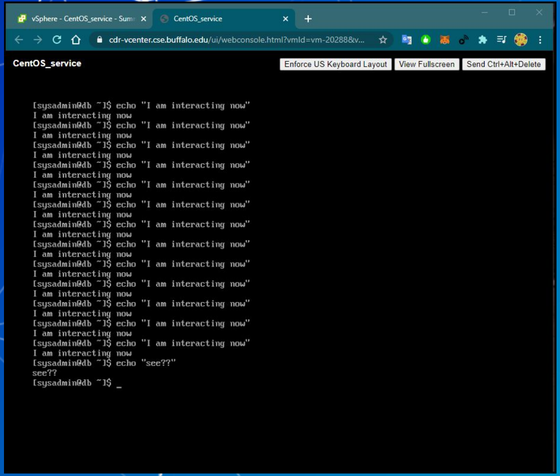

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Break slide

Please return on time!

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SysSec Coursework

- Assigned weekly
- Delivery and turn-in via UBLearns
  - Required .pdf format uploads
- Select weeks: System state
  - Scored separate of report deliverable
  - Remediation required
- Due the subsequent **Thursday, 7:04:59 pm**
- Almost strictly compliments lecture
  - Take good notes in-class!

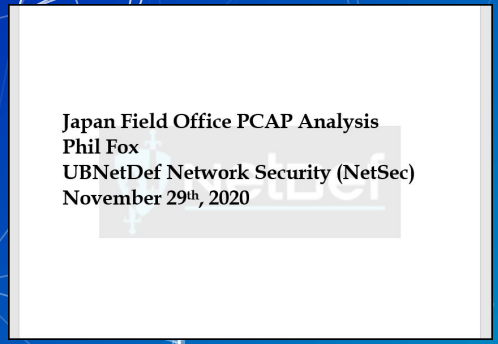
Coursework Support

- Office hours (as posted on the https://ubnetdef.org course page)

- General support in the Systems Security Mattermost channel
  - Subject to availability

Weekly coursework component: Reports

- Requirements
  - **Academic header or title page**
  - Table of contents (if more than 2 content pages)
  - Proper grammar and spelling
  - Instructional reports/report segments
    - Screenshots and descriptions supporting all pertinent steps
    - Note: Audience is not familiar with the systems in question
  - Informational reports/report segments
    - Citations
      - Consistent academic standard (e.g., MLA, IEEE)
      - Per-page in footer -or-
      - References/works cited page



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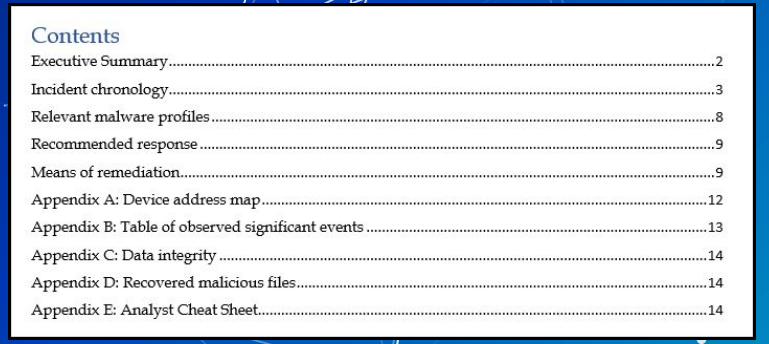
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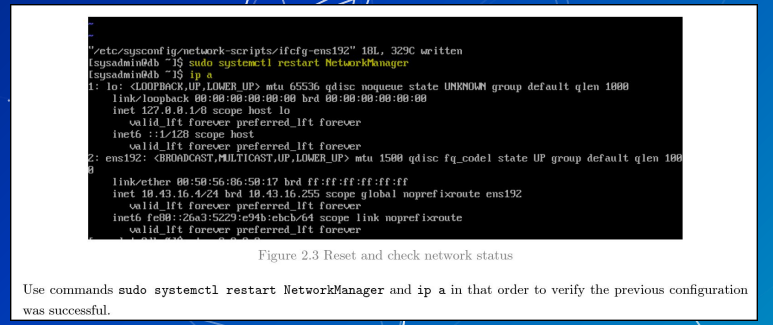
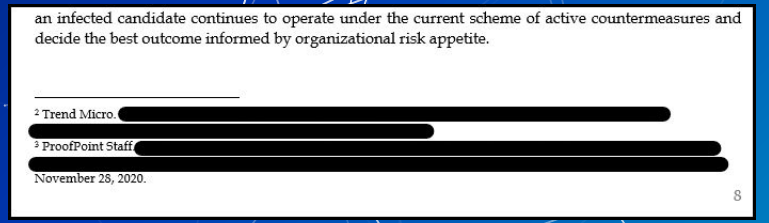


Figure 2.3 Reset and check network status

Use commands `sudo systemctl restart NetworkManager` and `ip a` in that order to verify the previous configuration was successful.

Weekly coursework component: Reports


an infected candidate continues to operate under the current scheme of active countermeasures and decide the best outcome informed by organizational risk appetite.

[2] Trend Micro. [redacted]

[3] ProofPoint Staff. [redacted]

November 28, 2020.

8

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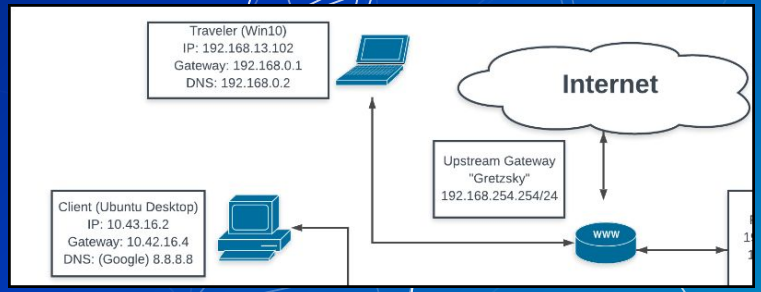
Common coursework component: Topology



- Topology: A network diagram
- Requirements
  - Generated with a diagram platform
    - draw.io/diagrams.net (recommended)
    - Lucidchart
    - Others that look as or more professional
  - Professional organization
  - All devices represented as if physically available
  - Device details correspond exactly to system states

Common coursework component: Remediation

- Some assignments are dependent on the completion of others.
  - Deliverables will specify a requisite, gradable "system state."
  - This state can be a "prerequisite" for the next assignment
- We will provide near-term feedback for remediation.
  - Aiming for end-of-lecture (i.e., a 3 hr. turnaround)

Homework 1 (HW01)

- Posted to UBLearns by 10 pm
- Install two clients from .iso on your network segment/vCenter folder
  - Client 1: Windows 10
  - Client 2: Ubuntu Linux Desktop version 18.04 (Bionic)
  - All usernames and passwords must match:
    - `sysadmin`
    - `Change.me!`
- Perform simple network tests on each using the CLI. Take screenshots!
- System state: Both client installations are complete and are network-connected.

Launch a VM from .iso

- In vCenter:
  - Choose the less familiar operating system in the prior slide
  - Follow your mentor’s instructions on how to launch an .iso!

Breakout 03

Launch a new VM from ISO

Agenda - Week 1

1. Welcome
   - 1.1. Introductions
   - 1.2. Opening remarks
   - 1.3. Ground rules
2. Overview
3. Virtualization
   - 3.1. In Class exercise: Go Virtualize
4. Coursework
   - 4.1. Workflow
   - 4.2. Support
   - 4.3. Reporting
   - 4.4. Topology
   - 4.5. Field Trip: Data Center
   - 4.6. Assignment: Homework 1
     - 4.6.1. In class exercise: Launch a new Virtual Machine (VM) from .iso
5. Summary/Wrap-up

Summary and wrap-up

Today's achievements:

- We met each other
- We learned about what UBNetDef is
- We talked about cybersecurity at a **high** level
- We did some virtualization
  - Launch a machine
  - Modify the virtual hardware settings
- We communicated the standards for reporting
- We described the homework process, this week's HW, and course resources

Don’t leave (yet)!

- Clarification on activities
- Homework help available
  - An early start gives you a huge edge on timely completion
  - Good time to address feedback for remediation when necessary

Parting questions

Now is the time!

Field Trip

Data Center

Class dismissed

See you next week!