

MODULE 1

Before we can get into the nitty gritty of what systems administration is, we need to talk about what these systems are. All musicians don't just run on their own, employees need computers along with access to the Internet to reach out to clients.

The organization websites needs to be up and running. Firewall have to be shared back and forth and so much more. All of these requirements make up the IT infrastructure of an organization.

What is System Administration?

IT infrastructure encompasses the software, the hardware, the network, a services required for an organization to operate in an enterprise IT environment.

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Without an IT infrastructure, employees wouldn't be able to do their jobs and the whole company will crumble before it even get started. So organizations employ the help of someone like a systems administrator to manage the company's IT infrastructure.

System administrators

They work in the background to make sure a company's IT infrastructure is always working, constantly fighting to prevent IT disasters from happening. The role of a sysadmin can vary depending on the size of an organization.

Network Administrators

Database Administrators

Servers Revisited

A sysadmin is responsible for their company's I.T. services.

email, file storage, running a website

Server and Client

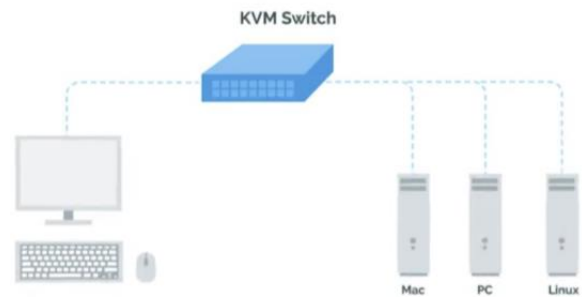
A server is essentially software or a machine that provides services to other software or machines. Clients request the services from a server and in turn, the servers respond with the services. A server can provide services to multiple clients at once and the client can use multiple servers. Any computer can be a server.

- Industry Standard Servers are typically running 24/7
- Servers can be towers that sit upright
- Rack servers which lay flat and are usually mounted in a 90" wide server rack.
- Blade servers that are even slimmer than racks.



KVM switch

KVM stands for keyboard, video and mouse. A KVM Switch looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor.

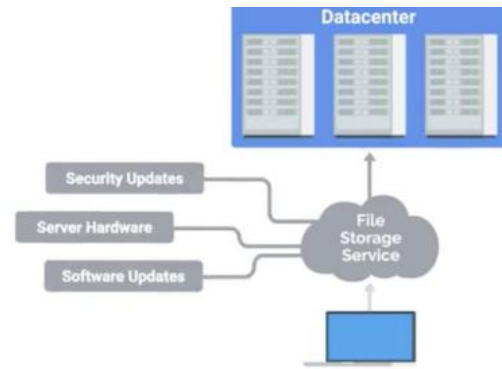


The Cloud

Cloud computing is the concept that you can access your data, use applications, store files, et cetera, from anywhere in the world as long as you have an internet connection.

Data Center

A data center is a facility that stores hundreds, if not thousands of servers. Large companies like Google and Facebook usually own their own data centers because they have billions of users that need access to their data at all times. Smaller companies could do this, but usually rent out part of a data center for their needs.



The same goes for your organization. Instead of managing your own servers, you can use internet services that handle everything for you including security updates, server hardware, routine software updates, and more.

Drawbacks

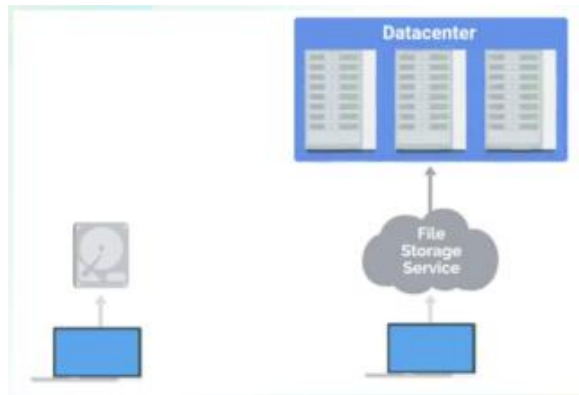
- Cost
- Dependency

The first is cost. When you buy a server, you pay upfront for the hardware. That way, you can set up your services like a file storage at potentially very little cost because you're the one managing it. When you use Internet services like Dropbox, that offer file storage online, the starting cost may be smaller. But in the long term, costs could add up since you're paying a fixed amount every month.

When comparing the cost of services, always keep in mind what a subscription could cost you for every user in your organization. Weigh that against maintaining your own hardware in the long term and then make a decision that works best for your organization.

The second drawback is dependency. Your data is beholden to these platforms. If there's an issue with the service, someone other than you is responsible for getting it up and running again. That could cost your company precious loss of productivity and data.

No matter what method you choose, remember that you're still responsible for the problems that arise when there's an issue. If Dropbox is having an issue



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with your important user data, it's still your problem and you have to get it working again no matter what.

To prevent a situation like that from popping up, you might consider backing up some critical data in the Cloud and on a physical disk. That way, if one system goes down, you have another way to solve the problem. Whether you choose to maintain physical service or use Cloud services, these are the type of things you need to think about when providing services to your company. In the next couple of lessons, we're going to talk about some of the other responsibilities of the system admin.

M1 SUPPLEMENTARY 1

KVM switch

A **KVM switch** (with **KVM** being an abbreviation for "keyboard, video and mouse") is a hardware device that allows a user to control multiple computers from one or more^[1] sets of keyboards, video monitors, and mice.

- Symbolic representation of a KVM switch. The computer on the right is currently being controlled by the peripherals.



- KVM switch



- Enterprise 1U rack mount KVM showing console and computerports for DVI and USB (keyboard/mouse)

Etymology

Before the mouse became relevant in server

switching applications, the term Keyboard Video Switch (KVS) was used to describe keyboard and monitor switching devices.^[2] With the increased adoption of Microsoft Windows, the mouse and other I/O ports in peripheral switching became prevalent. Remigius Shatas, the founder of Cybex (a popular peripheral switch manufacturer at that time) expanded the initialism to Keyboard, Video and Mouse (KVM) in 1995. Some years later, Universal Serial Bus (USB) began to become the new industry standard for connecting computer peripherals.

As a result of the growing need to switch peripherals (such as touchscreens) in addition to the keyboard, mouse and monitor, some companies are now selling "KVMP" switch devices (standing for keyboard, video, mouse and peripheral).

Types

With the popularity of USB—USB keyboards, mice, and I/O devices are still the most common devices connected to a KVM switch. The classes of KVM switches that are reviewed, are based on different types of core technologies in terms of how the KVM switch handles USB I/O devices—including keyboards, mice, touchscreen displays, etc. (USB-HID = USB Human Interface Device)

USB Hub Based KVM

Also called an *Enumerated KVM switch* or *USB switch selector*, a connected/shared USB device must go through the full initiation process (USB enumeration) every time the KVM is switched to another target system/port. The switching to different ports is just as if you were to physically plug and unplug a USB device into your targeted system.

Emulated USB KVM

Dedicated USB console port(s) are assigned to emulate special sets of USB keyboard or mouseswitching control information to each connected/targeted

system. Emulated USB provides an instantaneous and reliable switching action that makes keyboard hotkeys and mouse switching possible.

However, this class of KVM switch only uses generic emulations and consequently has only been able to support the most basic keyboard and mouse features. There are also USB KVM devices that allow cross-platform operating systems and basic keyboard and mouse sharing.

Semi-DDM USB KVM

Dedicated USB console port(s) work with all USB-HID (including keyboard and mouse), but do not maintain the connected devices' presence to all of the targeted systems simultaneously. This class of KVM takes advantage of DDM (Dynamic Device Mapping) technology.

DDM USB KVM

Dedicated USB console port(s) work with all USB-HID (including keyboard and mouse) and maintain the connected devices' special functions and characteristics to each connected/targeted system.

This class of KVM switch overcomes the frustrating limitations of an Emulated USB Class KVM by emulating the true characters of the connected devices to all the computers simultaneously. This means that you can now use the extra function keys, wheels, buttons, and controls that are commonly found on modern keyboards and mice.

Feature	Hub Base Class	Emulated Class	Semi DDM Class	DDM Class
USB re-enumeration required	Required on every switch of port	No, only for keyboard /mouse	No, for all USB-HID	No, for all USB-HID

Latency in sharing connected USB devices	Longest, depending on connected system's OS (about 10–15 seconds)	Short	Short	No Latency
Supports Hot-Key Command	No	Yes, only on dedicated keyboard port	Yes, all the console Semi-DDM ports	Yes, all the console DDM ports
Supports special keyboard and mouse functions	Limited*	No, only acts as standard keyboard/mouse	Yes	Yes
Windows 7/Windows 8 showing correct connected devices	Limited*	No, shows as standard keyboard and mouse no matter what keyboard/mouse are connected to the KVM	Yes	Yes

Window s7/Wind ows 8 built-in touchscr een monitor driver support	Limited*	No	Yes*	Yes				devices, Short switchi ng time (latency :within 1 sec.), Hot- Key comma nds (apply to all USB Semi-DDM ports), Lower cost than Full DDM class switche s	latency), Hot-Key command s (apply to all USB DDM ports)
Wireless combo keyboard and mouse support	Limited*	No	Yes*	Yes					
USB-HID (other than keyboard /mouse) support	Limited*	No	Yes*	Yes					
USB touchscree nsharing support	Limited*	No	Yes*	Yes					
Drawing tablet support	Limited*	No	Yes*	Yes					
USB wireless unifying receiver support	Limited*	No	Yes*	Yes					
Pros	Passes all signals between USB devices and target system/c omputer(s)	USB keyboar d/mouse switchin g control, shorter switchin g time, Hot-Key Comma nds	Full USB keyboar d/mous e switchi ng control, DDM ports can work with all USB-HID class	Full USB keyboard /mouse switching control, DDM ports can work with all USB-HID class devices, Shortest switching time (no					
					Cons	Longest latency, delay in device availabil ity, Can't use USB keyboar d/mouse to control KVM switchin g process, No Hot-Key comman d, Generat es HPD error when switchin g with particula	Support s only limited/ fixed general keyboar d and mouse profiles, Special keyboar d and mouse function s will not work, Can only share "standar d" USB keyboar d/mous e, Can't share other	Still has latenc y when switch ing	Higher cost

	r OS's	USB-HID such as: touchscreen monitor , drawing tablet, etc., Generated HPD error while using other USB-HID		
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Limited*=supported, but does not allow USB re-enumeration, which not only causes long delays in switching, but also sometimes causes HPD (Hot-Plug Device) errors to the OS system(s).

Yes*=Latency time within 1 second while switching between channels/ports.

Use

A KVM Switch is a hardware device, used in data centers, that allows the control of multiple computers from a single keyboard, monitor and mouse (KVM).^[5] This switch then allows data center personnel to connect to any server in the rack. A common example of home use is to enable the use of the full-size keyboard, mouse and monitor of the home PC with a portable device such as a laptop, tablet PC or PDA, or a computer using a different operating system.

KVM switches offer different methods of connecting the computers. Depending on the product, the switch may present native connectors on the device where standard keyboard, monitor and mouse cables can be attached.

Another method to have a single DB25 or similar connector that aggregated connections at the

switch with three independent keyboard, monitor and mouse cables to the computers. Subsequently, these were replaced by a special KVM cable which combined the keyboard, video and mouse cables in a single wrapped extension cable. The advantage of the last approach is in the reduction of the number of cables between the KVM switch and connected computers. The disadvantage is the cost of these cables.

The method of switching from one computer to another depends on the switch. The original peripheral switches (Rose, circa 1988) used a rotary switch while active electronic switches (Cybex, circa 1990) used push buttons on the KVM device. In both cases, the KVM aligns operation between different computers and the users' keyboard, monitor and mouse (user console).

In 1992-1993, Cybex Corporation engineered keyboard hot-key commands. Today, most KVMs are controlled through non-invasive hot-key commands (e.g. Ctrl+Ctrl, Scroll Lock+Scroll Lock and the Print Screen keys). Hot-key switching is often complemented with an on-screen display system that displays a list of connected computers.

Video bandwidth

While HDMI, DisplayPort, and DVI switches have been manufactured, VGA is still the most common video connector found with KVM switches, although many switches are now compatible with DVI connectors. Analogue switches can be built with varying capacities for video bandwidth, affecting the unit's overall cost and quality. A typical consumer-grade switch provides up to 200 MHz bandwidth, allowing for high-definition resolutions at 60 Hz.

For analog video, resolution and refresh rate are the primary factors in determining the amount of bandwidth needed for the signal. The method of converting these factors into bandwidth requirements is a point of ambiguity, in part because it is dependent on the analogue nature and state of the hardware. The same piece of equipment may require more bandwidth as it ages

due to increased degradation of the source signal.

Most conversion formulas attempt to approximate the amount of bandwidth needed, including a margin of safety. As a rule of thumb, switch circuitry should provide up to three times the bandwidth required by the original signal specification, as this allows most instances of signal loss to be contained outside the range of the signal that is pertinent to picture quality.

As CRT-based displays are dependent on refresh rate to prevent flickering, they generally require more bandwidth than comparable flat panel displays.

Monitor

A monitor uses DDC and EDID, transmitted through specific pins, to identify itself to the system. KVM switches may have different ways of handling these data transmissions:

None: the KVM switch lacks the circuitry to handle this data, and the monitor is not "visible" to the system. The system may assume a generic monitor is attached and defaults to safe settings.

Higher resolutions and refresh rates may need to be manually unlocked through the video driver as a safety precaution. However, certain applications (especially games) that depend on retrieving DDC/EDID information will not be able to function correctly.

Fake: the KVM switch generates its own DDC/EDID information that may or may not be appropriate for the monitor that is attached. Problems may arise if there is an inconsistency between the KVM's specifications and the monitor's, such as not being able to select desired resolutions.

Pass-through: the KVM switch attempts to make communication between the monitor and the system transparent. However, it may fail to do so in the following ways:

generating Hot Plug Detect (HPD) events for monitor arrival or removal upon

switching, or not passing monitor power states - may cause the OS to re-detect the monitor and reset the resolution and refresh rate, or may cause the monitor to enter to or exit from power-saving mode; not passing or altering MCSS commands - may result in incorrect orientation of the display or improper color calibration.

Microsoft guidelines recommend that KVM switches pass unaltered any I²C traffic between the monitor and the PC hosts, and do not generate HPD events upon switching to a different port while maintaining stable non-noise signal on inactive ports.

Passive and active (electronic) switches

KVM switches were originally passive, mechanical devices based on multi-pole switches and some of the cheapest devices on the market still use this technology. Mechanical switches usually have a rotary knob to select between computers. KVMs typically allow sharing of two or four computers, with a practical limit of about twelve machines imposed by limitations on available switch configurations. Modern hardware designs use active electronics rather than physical switch contacts with the potential to control many computers on a common system backbone.

One limitation of mechanical KVM switches is that any computer not currently selected by the KVM switch does not 'see' a keyboard or mouse connected to it. In normal operation this is not a problem, but while the machine is booting up it will attempt to detect its keyboard and mouse and either fail to boot or boot with an unwanted (e.g. mouseless) configuration. Likewise, a failure to detect the monitor may result in the computer falling back to a low resolution such as (typically) 640x480. Thus, mechanical KVM switches may be unsuitable for controlling machines which can reboot automatically (e.g. after a power failure).

Another problem encountered with mechanical devices is the failure of one or more switch

contacts to make firm, low resistance electrical connections, often necessitating some wiggling or adjustment of the knob to correct patchy colors on screen or unreliable peripheral response. Gold-plated contacts improve that aspect of switch performance, but add cost to the device.

Most active (electronic rather than mechanical) KVM devices provide peripheral emulation, sending signals to the computers that are not currently selected to simulate a keyboard, mouse and monitor being connected. These are used to control machines which may reboot in unattended operation. Peripheral emulation services embedded in the hardware also provides continuous support where computers require constant communication with the peripherals.

Some types of active KVM switches do not emit signals that exactly match the physical keyboard, monitor, and mouse, which can result in unwanted behavior of the controlled machines. For example, the user of a multimedia keyboard connected to a KVM switch may find that the keyboard's multimedia keys have no effect on the controlled computers.

Software alternatives

There are software alternatives to some of the functionality of a hardware KVM switch, such as Multiplicity, Input Director (<http://www.inputdirector.com>) and Synergy, which does the switching in software and forwards input over standard network connections. This has the advantage of reducing the number of wires needed. Screen-edge switching allows the mouse to function over both monitors of two computers.

Remote KVM devices

There are two types of remote KVM devices that are best described as local remote and KVM over IP.

Local remote (Including KVM over USB)

Local remote KVM device design allows users to control computer equipment up to 1,000 feet (300

m) away from the user consoles (keyboard, monitor and mouse). They always need direct cable connection from the computer to the KVM switch to the console^[9] and include support for standard category 5 cabling between computers and users interconnected by the switch device. In contrast, USB powered KVM devices are able to control computer equipment using a combination of USB, keyboard, mouse and monitor cables of up to 5 metres (16 ft).

KVM over IP (IPKVM)

KVM switch over IP devices use a dedicated micro-controller and potentially specialized video capture hardware to capture the video, keyboard, and mouse signals, compress and convert them into packets, and send them over an Ethernet link to a remote console application that unpacks and reconstitutes the dynamic graphical image. KVM over IP subsystem is typically connected to a system's standby power plane so that it's available during the entire BIOS boot process. These devices allow multiple computers to be controlled locally or globally with the use of an IP connection.^[9] There are performance issues related with LAN/WAN hardware, standard protocols and network latency so user management is commonly referred to as "near real time".

Access to most remote or "KVM" over IP devices today use a web browser, although many of the stand-alone viewer software applications provided by many manufacturers are also reliant on ActiveX or Java.

Whitelisting

Some KVM chipsets or manufacturers require the "whitelisting" or authority to connect to be implicitly enabled. Without the whitelist addition, the device will not work. This is by design and required to connect non-standard USB devices to KVMs. This is completed by noting the device's ID (usually copied from the Device manager in Windows), or documentation from the manufacturer of the USB device.

Generally all HID or consumer grade USB

peripherals are exempt, but more exotic devices like tablets, ordigitisers or USB toggles require manual addition to the white list table of the KVM.

Implementation

In comparison to conventional methods of remote administration (for example in-band Virtual Network Computing or Terminal Services), a KVM switch has the advantage that it doesn't depend on a software component running on the remote computer, thus allowing remote interaction with base level BIOS settings and monitoring of the entire booting process before, during, and after the operating system loads. Modern KVM over IP appliances or switches typically use at least 128-bit data encryption securing the KVM configuration over a WAN or LAN (using SSL).

KVM over IP devices can be implemented in different ways. With regards to video, PCI KVM over IP cards use a form of screen scraping where the PCI bus master KVM over IP card would access and copy out the screen directly from the graphics memory buffer, and as a result it must know which graphicschip it is working with, and what graphics mode this chip is currently in so that the contents of the buffer can be interpreted correctly as picture data. Newer techniques in OPMA management subsystem cards and other implementations get the video data directly using the DVI bus. Implementations can emulate either PS/2 or USB based keyboards and mice. An embedded VNC server is typically used for the video protocol in IPMI and Intel AMT implementations.

Computer sharing devices

KVM switches are called KVM sharing devices because two or more computers can share a single set of KVM peripherals. Computer sharing devices function in reverse compared to KVM switches; that is, a single PC can be shared by multiple monitors, keyboards, and mice. A computer sharing device is sometimes referred to as a KVM Splitter or reverse KVM switch. While not as common, this configuration is useful when the operator wants to access a single computer from two or more (usually close) locations - for

example, a public kiosk machine that also has a staff maintenance interface behind the counter, or a home office computer that doubles as a home theater PC.

System Administration Tasks

Organizational Policies

- Should users be allowed to install software?
- Should users have complex passwords with certain requirements? (symbols, Random numbers, and letter, minimum of 8 characters)
- Should you be able to view non-work related websites like facebook
- If you hand out a company phone to an employee should you set a device password?

In a small company, it's usually a sys admin's responsibility to decide what computer policies to use. In larger companies with hundreds of employees or more, this responsibility usually falls under the chief security officer.

But in smaller businesses or shops, as the IT lingo goes, the sys admin has to think carefully about computer security and whether or not to allow access to certain users. There are few common policy questions that come up in most IT settings that you should know. Should users be allowed to install software? Probably not. You could run the risk of having a user or accidentally install malicious software, which we'll learn about in the upcoming course in security.

Should users have complex passwords with certain requirements? It's definitely a good rule of thumb to create a complex password that has symbols, random numbers, and letters. A good guideline for a password blend is to make sure it has a minimum of 8 characters, that make it more difficult for someone to crack.

Should you be able to view non-work related websites like Facebook? That's a personal call. Some organisations prefer that their employees only use their work computer and network strictly for business, but many allow other uses, so their employee can promote their business or goods on social media platforms, stay up to date

on current events, and so on. It will definitely be a policy that you and your organization's leaders can work out together.

If you hand out a company phone to an employee, should you set a device password? Absolutely. People lose their mobile devices all the time. If a device is lost or stolen, it should be password protected, at the very least, so that someone else can't easily view company emails. We'll dive way deeper into the broader impact and implications of security and organizational policies in the security course that's last up in this program. These are just a few of the policy questions that can come up.

Documentation

If you're managing systems, you'll be responsible for documenting your company's policies, routine procedures, and more. You can store this documentation on internal wiki site, file server, software, wherever.

Whenever policies are decided upon, have to be documented somewhere. As you know from a lesson in documentation in the first course, it's supercritical to maintain good documentation. If you're managing systems, you'll be responsible for documenting your company's policies, routine procedures, and more.

You can store this documentation on internal wiki site, file server, software, wherever. The takeaway here is that having documentation of policies already available to your employees will help them learn and maintain those policies.

Infrastructure Services

- As an IT support specialist doing system administration, you'd be responsible for the IT infrastructure services in your organization.
- Managing services doesn't just mean setting them up. They have to be updated routinely, patched for security holes, and compatible with the computer within your organization.

We've talked a little bit about the services that are potentially used in an organization like file storage, email, web content, et cetera. But there are many

other infrastructure services that you need to be aware of.

As an IT support specialist doing system administration, you'd be responsible for the IT infrastructure services in your organization. Spoiler alert, there are a lot of them ahead. As always, make sure to rewatch any lessons if you need some more time for the material to sink in. Rome wasn't built in a day, you know, and neither are IT support specialists.

So, how about getting network access? That's a service that needs to be managed. What about secure connection to websites and other computers? You guessed it, that's also a service that has to be managed.

And managing services doesn't just mean setting them up. They have to be updated routinely, patched for security holes, and compatible with the computer within your organization. Later in this course, we'll dive deeper into the essential infrastructure services that you might see in an IT support specialist role.

User and Hardware provisioning

- Managing users and hardware
- Sys admins have to be able to create new users and give them access to their company's resources
- remove users from an IT infrastructure if users leave the company
- also responsible for user machines
- a user is able to log in and that the computer has the necessary software that a user needs to be productive
- ensure that the hardware they are provisioning or setting up for users is standardized

Not only do sys admins have to standardize settings on a machine, they have to figure out the hardware lifecycle of a machine.

- When was it built?
- When was it first used?
- Did the organization buy it brand new or was it used?

- Who maintained it before?
- How many users have used it in the current organization?
- What happens to this machine if someone needs a new one?

Hardware Lifecycle

- Procurement. This is the stage where hardware is purchased or re-used for any employee.
 - Deployment. This is where hardware is set up so that the employee can do their job.
 - Maintenance. This is the stage where software is updated and hardware issues are fixed if and when they occur.
 - Retirement. In this final stage, hardware becomes unusable or no longer needed and it needs to be properly removed from the fleet.
- First, a new employee is hired by the company, human resources tells you to provision a computer for them and set up their user account. Next, you allocate a computer you have from your inventory or you order a new one if you need it. When you allocate hardware you may need to tag the machine with a sticker so they can keep track of which inventory belongs to the organization.
 - Next, you image the computer with the base image for further using a streamlined method that we discussed in our last course, operating systems and you. Next, you name the computer with a standardized host name. This helps with managing machines.
 - More on that when we talk about directory services later. In regards to the name itself, we talked about using a format such as username-location, but other host name starters can be used. Check out the supplemental reading to find out more.

- After that, you install software the user needs on their machine. Then the new employee starts and you streamline the setup process for them by providing instructions on how to log into their new machine, get email etc.
- Eventually, if a computer sees a hardware issue, a failure, you look into it and think through the next steps. If it's getting too old, you'll have to figure out where to recycle it and where to get new hardware.
- Finally, if a user leaves the company you'll also have to remove their access from IT resources and wipe the machine so that you can eventually re-allocate it to someone else. Imaging. Installing software and configuring settings on a new computer can get a little time consuming. In a small company you don't do it often enough where it makes much of a difference, but in a larger company a time consuming process just won't cut it. You'll have to learn automated ways to provision new machines so that you only spend minutes on this and not hours.

Routine Maintenance

- constantly provide updates and maintenance so that they run the latest secure software.
- to effectively update and manage hardware, you do something called batch update.
- Batch update. This means that once every month or so, you update all your servers with the latest security patches.
- keep your system secure by installing the latest security patches routinely

Vendors

- cellphones or desk phones
- Printers
- fax machine
- Video-audio conferencing machines
- Working with vendors or other businesses to buy hardware is a common practice. Setting up businesses accounts with vendors like Hewlett Packard, Dell, Apple, etc., is usually

beneficial since these companies can offer discounts to businesses.

Troubleshooting and Managing Issues

- when you're managing an entire IT infrastructure, you'll constantly have to troubleshoot problems and find solutions for your IT needs.
- Sys admins also have to troubleshoot and prioritize issues at a larger scale.
- The first is troubleshooting, asking questions, isolating the problem, following the cookie crumbs, and reading logs
- the second super important skill that we covered is customer service; showing empathy, using the right tone of voice and dealing well with difficult situations.
- In some companies, sysadmins have to be available around the clock. If a server or network goes down in the middle of the night, someone has to be available to get it working again. someone has to be available to get it working again.
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A common industry standard is to use some sort of **ticketing or bug system**.

- In some companies, sysadmins have to be available around the clock. If a server or network goes down in the middle of the night, someone has to be available to get it working again. Don't worry, a sysadmin doesn't have to be awake and available 24/7.
- They can monitor their service and have it alert them in case of a problem. So how do you keep track of your troubleshooting? A common industry standard is to use some sort of ticketing or bug system. This is where users can request help on an issue and then you can track your troubleshooting work, through the ticketing system. This helps you organize and prioritize issues and document troubleshooting steps.

In Case of Fire, Break Glass

- something at some point will stop working, no matter how much planning you do.
- You can't account for everything, but you can be prepared to recover from it.
- make sure that your company's data is routinely backed up somewhere

Applying Changes

Pseudo-command principle

- Avoid using administrator rights for tasks that don't require them.
 - Try to minimize the time spent in an administrative session.
 - In Linux systems, we usually use the pseudo command to execute commands as an administrator.

```
test-user@linux-instance:~$ sudo ls
We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:

#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.

[sudo] password for test-user: [ ]
```

- Respect the privacy of others
 - Don't use your administrator rights to access private information that you have no business accessing.
- Think before you type.
 - Think through what you're doing and don't rush.
 - It allows you to plan ahead and serves as documentation of what you did.
 - Documenting what you did is crucial when using administrator rights.
 - Listing the commands you executed let's you repeat the same exact process in the future and fix any problems that may come up later
- With great power comes great responsibility.
 - The more you can do with your administrator rights, the more you can mess up.

Reverting to the previous state is called a **rollback**. Some commands are easy to roll back than others.

- The more important your service is to your company's operations, the more you'll work to keep the service up.

Never Test in Production

- In an infrastructure context, we call the parts of the infrastructure where certain services are executed and serve to its users production.
- If you host a website, the service that deliver the website content to the users are the production servers.
- Inside your company, the servers that validate users' passwords are the production authentication servers.
 - The key to safely making these changes is to always run them through a test environment first.
 - The test environment is usually a virtual machine running the same configuration as a production environment, but isn't actually serving any users of the service secondary or a stand-by machine. This machine will be exactly the same as a production machine, but won't receive any traffic from actual users until you enable it to do so.
 - For even bigger services, when you have lots of servers providing the service, you may want to have canaries.
 - You'll use a small group of servers to detect any potential issues in the larger changes you want to push out in the system. Once you verify that it works correctly on those machines, you then deploy the change to the rest of the fleet.

Assessing Risk

- Document what you do and have a way to revert to the previous state.
- The amount of time and effort you invest in each of these steps depends on the risk involved.
- In general, the more users your service reaches, the more you'll want to ensure that changes aren't disruptive.

- We've mentioned before that you should always test your changes before deploying. Document what you do and have a way to revert to the previous state. The amount of time and effort you invest in each of these steps depends on the risk involved. You should always have a test instance for trying out changes. But it might not be worth having a secondary server if nobody cares about downtime.
- So, how do you decide how much time and effort to invest? We can assess the risk involved by considering how important the services to the infrastructure and how many users would be impacted if the service went down. Certain services are mission critical. If the centralized authentication system is down, no one will ever be able to log in.
- If the billing system is unreachable, the company won't be able to receive payments. If your backups are lost, you have no safeguards in the event of a disaster. But not all services are mission critical. An informational website isn't as critical as an ecommerce site. An internal ticket system isn't as critical as an external customer support application. The infrastructure needed for a new installation isn't as critical as the one used for logging into existing machines. In general, the more users your service reaches, the more you'll want to ensure that changes aren't disruptive.
- The more important your service is to your company's operations, the more you'll work to keep the service up. You may have a user agreement about the expectation of a service availability. For example, in lots of companies, disruptive maintenance is performed on the weekend. In these cases, it's agreed that it's fine if the main file server is down on Saturday while you make any changes.

- You can also use these criteria to establish priorities for fixing a problem. If the problem is preventing people from doing their work, finding a solution to it should have a higher priority than solving a minor annoyance that can be worked around.

Fixing Things the Right Way

Reproduction case. you're creating a roadmap to retrace the steps that led the user to an unexpected outcome

- What steps did you take to get to this point?
- What's the unexpected or bad result?
- What's the expected result?

Remember, always do this in your test instance, never in production. After applying your fix, retrace the same steps that took you to the bad experience. If your fix worked, the expected experience should now take place.

Recording your actions

When you are going to make changes in a machine, it's very important to have a clear plan of what you are going to do and to store the actions that you actually took. A common practice for system administrators that work with bug queues or ticketing systems is to include the commands executed and the output obtained in the corresponding bug or ticket. This is recommended if the commands that need to be executed are few and straightforward.

However, there are situations where you don't yet know which commands exactly you'll need to execute because there's some investigation that needs to happen. In cases like that, it can be helpful to use a command like script for Linux or Start-Transcript for Windows.

Script

In the case of script, you can call it like this:

```
script session.log
```

This will write the contents of your session to the session.log file. When you want to stop recording,

you can write exit or press Ctrl-D. The generated file will be in ANSI format which includes the colors that were displayed on screen. In order to read them, you can use commands like ansi2txt or ansi2html to convert it to plain text or HTML respectively

Start-Transcript

In the case of Start-Transcript, you can call it like this:

```
Start-Transcript -Path C:\Transcript.txt
```

This will write the contents of the session to C:\Transcript.txt. When you want to stop recording you need to call Stop-Transcript. The file created is a plain text file where the commands executed and their outputs are stored.

Recording Graphical Sessions

Performing system administration actions through a Graphical user interface is less common (as it's harder to automate and to perform remotely), but it's still something that may happen sometimes.

If you are going to be performing an action that needs to be done graphically and you can document what you are doing, you can use a specialized tool like record My Desktop for Linux, or general video tools like OBS or VLC.

F1. 29/30

1. **A Universal Switch looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor.**
 - False
 - True
2. **Test environment is a virtual machine running the same configuration as a production environment.**
 - False
 - True

3. _____ works in the background to make sure the IT infrastructure of the company is always working and they prevent IT disasters from happening.
 - Network Administrators
 - Network Engineers
 - Database Administrators
 - System Administrators
4. Correct customer service is not showing empathy, not using the right tone of voice and dealing well with difficult situations.
 - False
 - True
5. Communicating with customer service is the process of asking questions, isolating the problem and reading logs.
 - False
 - True
6. _____ request the services from a server.
 - Slaves
 - Clients
 - Requestors
 - Students
7. Structural Policies are general statements of how an organization want to behave and procedures define exactly how to do a task or perform step by step.
 - **False**
 - True
8. With great power comes great responsibility
 - False
 - True
9. tr
 - All of the above
 - Setting up new user accounts and machines
 - Maintaining servers
 - Troubleshooting user issues
10. Deployment is the stage where hardware is purchased or re-used for any employee.
 - False
 - True
11. Which of these is considered a server? Check all that apply.
 - A software that provides a service to other software
 - Software that provides a service to other machines
 - Software that's only available to the computer it's installed on
 - A computer that provides a service to other computers.
12. Communication servers are the service that delivers the website content to the users.
 - False
 - True
13. Not all computer can be a server
 - False
 - True
14. SysAdmin are responsible for managing users and hardware
 - False
 - True
15. Database Administrators work in the background to make sure a company's IT infrastructure is always working, constantly fighting prevent IT disasters from happening.
 - **False (sysadmin dapat)**
 - True
16. A computer center is a physical facility that enterprises use to house their business – critical applications and information.
 - False
 - True
17. As a SysAdmin, you have think before you type
 - False
 - True
18. As a SysAdmin, you have to respect the privacy of other
 - False
 - True
19. A data center is a physical facility that enterprises use to house their business – critical applications and information.
 - False
 - True
20. A _____ looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor.

- Hybrid hub
 - Universal Switch
 - **KVM Switch**
 - Cisco 2960 Switch
21. ____ constantly provide updates and maintenance so that they run the latest secure software.
- **Routine Maintenance**
 - IT Management
 - IT normalization
 - Routine Management
22. Removing users from an IT infrastructure if users leave the company is not part of user provisioning
- **False**
 - True
23. Assumptions lists company's policies, routine procedures, and more
- **False**
 - True
24. SysAdmins are not responsible for user machines
- **False**
 - True
25. Documenting what you did is crucial when using administrator rights.
- **True**
 - False
26. SysAdmin need to document what they do and have a way y to revert to the previous state
- **True**
 - False
27. Maintenance is where hardware is set up so that the employee can do their job.
- **False**
 - True
28. SysAdmin is not responsible in ensuring that the hardware they are provisioning or setting up for users is standardized.
- **False**
 - True
29. What are the benefits of local computing over cloud computing? Check all that apply.

- **You have complete control of the IT infrastructure**
- **Updates can be handled at anytime**
- There are potential long-term costs associated with local computing
- Services are handled by another organization, so that makes your organization dependent on a third party

30. Maintenance is the stage where software is updated and hardware issue are fixed if and when they occur.

- **Maintenance**
- Retirement
- Procurement
- Deployment.

F1. 29/30

- Maintenance is the stage where software is updated and hardware issues are fixed if and when they occur.
 - **False**
 - **True**
- A ____ is a physical facility that enterprises use to house their business-critical applications and information.
 - Management information system
 - Network facility
 - Computer center
 - **Data center**
- Industry Standard Servers are not running 24/7
 - **False**
 - True
- System administrators work in the background to make sure a company's IT infrastructure is always working, constantly fighting to prevent IT disasters from happening
 - **True**
 - False
- Which of the following can be a responsibility of a systems administrator?

- Setting up new user accounts and machines
 - Maintaining servers
 - Troubleshooting user issues
 - **All of the above**
6. Tower servers are built in an upright cabinet that stands alone.
- False
 - **True**
7. Development is where hardware is set up so that the employee can do their job.
- **True**
 - False
8. Communicating with customer service is the process of asking questions, isolating the problem and reading logs.
- True
 - **False**
9. Which of these is considered a server? Check all that apply.
- **Software that provides a service to other machines**
 - Software that's only available to the computer it's installed on
 - **A computer that provides a service to other computers (ito yung isa)**
 - **A software that provides a service to other software**
10. In some companies, sysadmins have to be available around the clock
- False
 - **True**
11. Production servers are the service that deliver the website content to the users.
- False
 - **True**
12. ____ constantly provide updates and maintenance so that they run the latest secure software.
- IT management
 - Routine management
 - **Routine Maintenance**
 - IT normalization
13. A server is essentially software or a machines that provides services to other software or machines.
- False
- **True**
14. It is advisable to use administrator rights for tasks that don't require them.
- **False**
 - True
15. A computer center is a physical facility that enterprises use to house their business – critical applications and information.
- True
 - **False**
16. A drawback of Cloud Computing is dependency.
- **True**
 - False
17. As a SysAdmin, you have think before you type
- **True**
 - False
18. Avoid using administrator rights for tasks that don't require them.
- False
 - **True**
19. ____ can provide a broad range of hardware, software and services
- **Manufacturers**
 - Vendors
 - Marketers
 - Clients
20. Tower server is a stripped-down server computer with a modular design optimized to minimize the use of physical space and energy.
- True
 - **False**
21. SysAdmins does not work with vendors or other businesses to buy hardware.
- **False**
 - True
22. SysAdmin are not responsible for user machines
- True
 - **False**
23. ____ is where hardware is set up so that the employee can do their job.
- Maintenance
 - Procurement
 - Retirement

- **Deployment**

24. Communications infrastructure encompasses the software, the hardware, network, and services required for an organization to operate in an enterprise IT environment.

- **False**
- True

25. Reproduction case is creating a roadmap to retrace the steps that led the user to an unexpected outcome.

- **True**
- False

26. _____ is where hardware becomes unusable or no longer needed and it needs to be properly removed from the fleet.

- **Retirement**
- Deployment
- Maintenance
- Procurement

27. _____ is a virtual machine running the same configuration as a production environment

- Geographical environment.
- IT infrastructure
- **Test environment**
- Live environment

28. Which of the following make up IT infrastructure?

- Operating systems
- **All of the above**
- Hardware and software
- Network

29. Maintenance is where hardware is set up so that the employee can do their job.

- **False**
- True

30. Industry Standard Servers are typically running 24/7

- False
- **True**

SysAdmins is not responsible in ensuring a user is able to log in and that the computer has the necessary software that a user needs to be productive

- **False**

A KVM Switch looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor.

- **True**

Vendors can't provide a broad range of hardware, software and services

- **True**

Reproduction case is creating a roadmap to retrace the steps that led the user to an unexpected outcome

- **True**

_____ validate users' passwords

- Tunnels Authentication Servers
- Communication Authentication Servers
- Bridges Authentication Servers
- **Production Authentication Servers**

SysAdmins are not responsible for user machines

- **False**

A _____ is a physical facility that enterprises use to house their business- critical applications and information.

- management information system
- computer center
- network facility

F1 24.5/30

SysAdmins don't have to troubleshoot and prioritize issues at a larger scale

- **False**

- **data center**

Removing users from an IT infrastructure if users leave the company is part of user provisioning

- **True**

Rack server which lay flat and are usually mounted in a 90" wide server rack

- **True**

The more users your service reaches, the less you'll want to ensure that changes aren't disruptive

False

A Universal Switch looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor.

- **False**

A drawback of Cloud Computing is Cost

- **True**

Canary Testing is a way to reduce risk and validate new software by releasing software to a small percentage of users

- **True**

Tower servers are built in an upright cabinet that stands alone.

- **True**

A client is essentially software or a machine that provides services to other software or machines.

- **False**

Live Testing is a way to reduce risk and validate new software by releasing software to a small percentage of users

- **False**

With great power comes less accountability.

- **False**

KVM stands for keyboard, video and mouse

- **True**

_____ can provide a broad range of hardware, software and services

- **Manufactures**
- Vendors
- Clients
- Marketers

As a SysAdmin, you have think before you type

- **True**

What are the benefits of cloud computing over local computing? Check all that apply.

- There are potential long-term costs associated with cloud computing
- **Software updates are handled by the company providing the service**
- **Services are accessible from anywhere in the world**
- **There are smaller starting costs for cloud computing**

Which of the following make up IT infrastructure?

- Operating systems
- **All of the above**
- Hardware and software
- Network

Routine Management constantly provide updates and maintenance so that they run the latest secure software.

- **False (Routine Maintenance hindi management)**

In some companies, sysadmins have to be available around the clock

- **True**

As a SysAdmin, you don't think through what you're doing and don't rush.

- **False**

SysAdmins work with vendors or other businesses to buy hardware

- **True**

Reverting to the previous state is called a _____

- backup
- **rollback**
- rewind
- flashback

Vendors can provide a broad range of hardware, software and services

- **False**

After applying your fix, you don't have to retrace the same steps that took you to the bad experience.

- **False**

1. ____ are general statements of how an organization want to behave and procedures define exactly how to do a task or perform step by step **[ORGANIZATIONAL POLICIES]**
2. Maintenance is the stage where software is updated and hardware issues are fixed if and when they occur **[MAINTENANCE]** (sabog gumawa ng question nato HAHAAHAHAHAH)
3. What are the benefits of cloud computing over local computing? Check all that apply.
 - There are potential long-term costs associated with cloud computing
 - **There are smaller starting costs for cloud computing (eto din dapat sagot)**

- **Software updates are handled by the company providing the service (eto din dapat)**
 - **Services are accessible from anywhere in the world**
4. Communicating with customer service is the process of asking questions, isolating the problem and reading logs **[FALSE]**
 5. SysAdmins need to document what they do and have a way to revert to the to the previous state **[TRUE]**
 6. IT infrastructure encompasses the software, the hardware, network, and services required for an organization to operate in an enterprise IT environment **[TRUE]**
 7. Routine management constantly provide updates and maintenance so that they run the latest secure software. **[FALSE]**
 8. What are the benefits of local computing over cloud computing? Check all that apply.
 - There are potential long-term costs associated with local computing
 - Services are handled by another organization, so that makes your organization dependent on a third party
 - **You have complete control of the IT infrastructure**
 - **Updates can be handled at anytime**
 9. ____ constantly provide updates and maintenance so that they run the latest secure software **[ROUTINE MAINTENANCE]**
 10. Slaves request the services from a server **[FALSE]**
 11. Client Server computing is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. **[TRUE]** – **False (dapat cloud computing)**
 12. SysAdmins don't have to troubleshoot and prioritize issues at a larger scale **[FALSE]**
 13. ____ which lay flat and are usually mounted in a 90" wide server rack **[RACK SERVER]**
 14. Database Admins have to be able to create new users and give them access to their company's resources **[FALSE]**

15. A drawback of Cloud Computing is Dependency **[TRUE]**
16. Test environments is a virtual machine running the same configuration as a production environment **[TRUE]**
17. Communication servers are the service that deliver the website content to the users **[FALSE]**
18. ___ is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. **[CLOUD COMPUTING]**
19. Communication AUTHENTICATION Servers validate users' passwords **[FALSE]**
20. SysAdmins don't need to document what they do and have a way to revert to the previous state **[FALSE]**
21. A server can provide services to multiple clients at once and the client can use multiple servers **[TRUE]**
22. SysAdmins is not responsible in ensuring that the hardware they are provisioning or setting up for users is standardized **[FALSE]**
23. Database Administrators work in the background to make sure a company's IT infrastructure is always working, constantly fighting to prevent IT disasters from happening **[FALSE]**
24. Which of these is considered a server? Check all that apply.
- **Software that provides a service to other machines**
 - **A software that provides a service to other software (eto din dapat)**
 - Software that's only available to the computer it's installed on
 - **A computer that provides a service to other computers**
25. SysAdmins ensure that the hardware they are provisioning or setting up for users is standardized **[TRUE]**
26. Correct customer service is showing empathy, using the right tone of voice and dealing well with difficult situations. **[TRUE]**
27. As a SysAdmin, you don't think through what you're doing and don't rush. **[FALSE]**
28. Rack server which lay flat and are usually mounted in a 90" wide server rack **[TRUE]**
29. Don't use you administrator rights to access private information that you have no business accessing **[TRUE]**
30. SysAdmins are not responsible for managing users and hardware **[FALSE]**
-
- 26/30 (natama na pero may 2 pang dapatt makita na mali since 2 pa lang din natatama)
1. You may do Reproduction case in your production **[TRUE]**
 2. ___ is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. **[CLOUD COMPUTING]**
 3. Cloud Computing is the delivery of different services through the Internet. These resources include tools and applications like data storage, servers, databases, networking, and software. **[TRUE]**
 4. ___ is the stage where hardware is purchased or re-used for any employee **[PROCUREMENT]**
 5. Unit testing is creating a roadmap to retrace the steps that led the user to an unexpected outcome **[FALSE]**
 6. With great power comes great responsibility **[TRUE]**
 7. The more users your service reaches, the less you'll want to ensure that changes aren't disruptive **[FALSE]**
 8. After applying your fix, retrace the same steps that took you to the bad experience **[TRUE]**
 9. Maintenance is where hardware is set up so that the employee can do their job **[FALSE]**
 10. As a SysAdmin, you don't have think before you type **[FALSE]**

11. ____ is where hardware is set up so that the employee can do their job
[DEPLOYMENT]
 12. Database Administrators work in the background to make sure a company's IT infrastructure is always working, constantly fighting to prevent IT disasters from happening **[FALSE]**
 13. Blade server is a stripped-down server computer with a modular design optimized to minimize the use of physical space and energy **[TRUE]**
 14. Assumptions lists company's policies, routine procedures, and more **[FALSE]**
 15. Productions is the part of infrastructure where certain services are executed and serve its user **[FALSE] – True dapat**
 16. ____ is creating a roadmap to retrace the steps that led the user to an unexpected outcome
[REPRODUCTION CASE]
 17. Tower servers are built in an upright cabinet that stands alone **[TRUE]**
 18. A universal switch looks like a hub that you can connect multiple computers to and control them using one keyboard, mouse and monitor **[FALSE]**
 19. Industry Standard Servers are typically running 24/7 **[TRUE]**
 20. ____ are the service that deliver the website content to the users **[PRODUCTION SERVERS]**
 21. Production environment is a virtual machine running the same configuration as a production environment **[FALSE]**
 22. Troubleshooting is the process of asking questions, isolating the problem and reading logs **[TRUE]**
 23. A data center is a physical facility that enterprises use to house their business-critical applications and information.
[FALSE] – True dapat
 24. SysAdmins is not responsible in ensuring a user is able to log in and that the computer has the necessary software that a user needs to be productive **[TRUE]**
 25. Structural Policies are general statements of how an organization want to behave and procedures define exactly how to do a task or perform step by step **[FALSE]**
 26. After applying your fix, you don't have to retrace the same steps that took you to the bad experience. **[FALSE]**
 27. Communicating with customer service is the process of asking questions, isolating the problem and reading logs **[FALSE]**
 28. Procurement is where hardware becomes unusable or no longer needed and it needs to be properly removed from the fleet **[FALSE]**
 29. Cost is not a drawback of Cloud Computing **[FALSE]**
 30. System administrators work in the background to make sure a company's IT infrastructure is always working, constantly fighting to prevent IT disasters from happening **[TRUE]**
-

MODULE 2

Infrastructure Service

What are IT Infrastructure Services?

I.T. infrastructure services are what allows an organization to function.

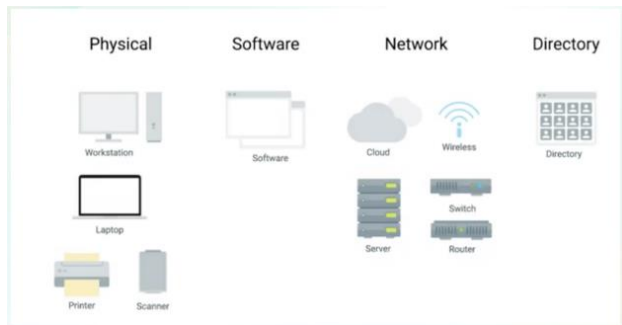
- connecting to the internet, managing networks by setting up the network hardware, connecting computers through an internal network

Role of IT Infrastructure Services in SysAdmin

- In a smaller company, a single person could be responsible for all these services.
- In larger companies, teams assist admins might manage just one service.
- cloud services are services that are accessed through the internet like, Gmail.

Types of IT Infrastructure

- Physical
- Software
- Network
- Directory



network, isn't going to be like your network at home. You're going to have multiple computers that need to be on a certain subnet. You have to assign them IP addresses statically or using DHCP. The networking hardware has to be set up, wireless internet will probably need to be available, DNS needs to be working et cetera.

NaaS

- Networking as a Service or NaaS
- NaaS allows companies to offshore their networking services so that they don't have to deal with the expensive networking hardware



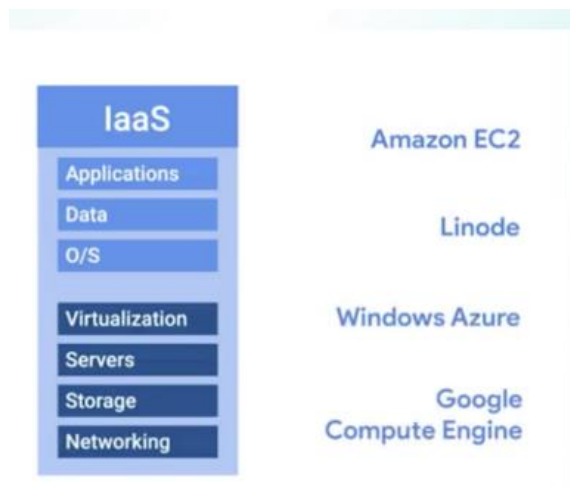
- Companies also won't have to set up their own network security, manage their own routing, set up a WAN and private internets, and so on. For more about NaaS providers, check out the supplemental reading. Let's talk about the software that your company might want to use.

SaaS

- Software as a Service
- Instead of installing a word processor on every machine, you can use Microsoft Office 365 or Google G suite.

IaaS

- Infrastructure as a Service
- IaaS providers give you pre-configured virtual machines that you can use just as if you had a physical server.



- IaaS providers give you pre-configured virtual machines that you can use just as if you had a physical server. Some popular IaaS providers are, Amazon Web Services and their Elastic Compute Cloud or EC2 instances, Linode, which runs out virtual servers, Windows Azure, and Google Compute Engine, which you've been using throughout this course.
- You can read more about the different IaaS providers in the supplemental reading right after this video. Your company's internal



Microsoft Office 365

Google G Suite

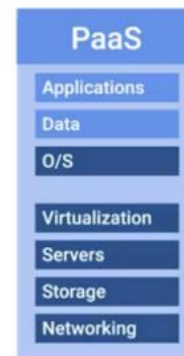
- Do you need to type out word documents, use an email client, communicate with other people, use operating systems, process spreadsheets or have any of other software needed to run a business? I bet yes. The right software has to be available to your company's users. We've already discussed how to install and maintain software in machines. You have to deal with things like licences, security, updates, and maintenance for each machine.
- The Cloud alternative to maintaining your own software is known as Software as a Service, or SaaS. Instead of installing a word processor on every machine, you can use Microsoft Office 365 or Google G suite. These are both services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser.
- You can check out the next supplemental reading for more about SaaS providers. Some companies have a product built around a software application. In this case, there is some things that software developers need to be able to code, build and shape their software. First, specific applications have to be installed for their programming development environment.
- Then, depending on the product, they might need a database to store information. Finally, if they're serving web content like a website, they'll need to publish their product on the internet. If you're building this entire pipeline

yourself, you may need to set up a database and a web server. The programming development environment will also have to be installed on every machine that needs it.

PaaS

• Platform as a Service

- includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform



Heroku

Windows Azure

Google App Engine

- If you want an all-in-one solution to building and deploying a web application, you can use something called Platform as a Service, or PaaS. This includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform.
- Popular options for PaaS are, Heroku, Windows Azure, and Google App Engine. As you might have guessed, you can read more about PaaS providers in the supplemental reading.

DaaS

• Directory as a Service

- A directory service, centralizes your organizations users and computers in one location so that you can add, update, and remove users and computers.
- The last IT infrastructure service we'll discuss is the management of users, access and

authorization. A directory service, centralizes your organizations users and computers in one location so that you can add, update, and remove users and computers. Some popular directory services that you can set up are Windows Active Directory, OpenLDAP, and we'll dive a little deeper into both of these later on in this course.

- Directory services can also be deployed in the Cloud using Directory as a Service, or DaaS providers. Guess we can read more about DaaS providers. That's right, in the supplemental reading. There you have it. This is a general overview of the most common IT infrastructure services you'll encounter when handling system administration tasks.
- While Cloud Services are a great option, it's super important that you understand how a service works and how to maintain before you employ the help of a Cloud Service. Even though Cloud Service are widely used in the industry, and have a lot of pros, there are also some cons. These include recurring cost, and the need to depend on the providers service. We're going to teach you about the technical details and the implementation of these common IT infrastructure services.

Physical Infrastructure Services

Server operating systems are regularly operating systems that are optimized for server functionality.

- Windows - Windows Server.
- Linux - Ubuntu server
- Mac - Mac OS Server

Server operating systems are usually more secure and come with additional services already built in.

- When you want to set up a server, you essentially install a service or application on that server like a FAS storage service. The net server will provide those services to the machines that request it. Maybe you thought you'd install services on, or use operating

system like Windows 10. While that's an option, typically, in an organization, you want to install your services on a server operating system. Server operating systems are regularly operating systems that are optimized for server functionality.

- This includes functions like allowing more network connections and more RAM capacity. Most operating systems have versions specifically made for servers. In windows, you have Windows Server. In Linux, many distributions come with server counter protests like Ubuntu server, which is optimized for server use.
- Mac OS is also available in Mac OS Server. Server operating systems are usually more secure and come with additional services already built in. So, you don't have to set up these services separately. You can read more about the different server operating systems in the next supplemental reading. For now, just keep in mind that when you install services on a server, you should be sure to use a dedicated server operating system.

Virtualization

There are two ways you can run your services, either on dedicated hardware or on a virtualized instance on a server.

When you virtualize a server, you're putting lots of virtual instances on one server. Each instance contains a service.

- Performance
 - better performance than a service running in a virtualized environment
- Cost
 - server hardware can be expensive.
 - It's cheaper to run several services on one machine than it is to run many services on multiple machines
- Maintenance

- With virtualized service, you can quickly stop your service or migrate them to another physical server
- Points of Failure
 - you have duplicate servers as a backup
 - Performance, a service running on dedicated hardware will have better performance than a service running in a virtualized environment. This is because you only have one service using one machine as opposed to many services using one machine.
 - Cost, server hardware can be pretty expensive. If you put a service on one piece of dedicated hardware and have to do that for nine other services, it starts to add up. One of the huge benefits to virtualizing your service is that you can have ten services running on ten different virtual instances, all on one physical server. Here's another way to think about this, in a typical server if you only have one service running it's probably only taking up 10-20% of your CP utilization, the rest of the hardware isn't being utilized. You can add plenty more services to the physical server and still have a good threshold for resource utilization. It's cheaper to run several services on one machine than it is to run many services on multiple machines.
 - Maintenance, servers require hardware maintenance and routine operating system updates. Sometimes you need to take the servers offline to do that maintenance. With virtualized service, you can quickly stop your service or migrate them to another physical server, then take as much time as you need for maintenance. Virtualized service makes server maintenance much easier to do.
 - Points of failure, when you put a service on one physical machine and that

machine has issues, you're entering a world of trouble. With virtualized service, you can easily move services off a physical machine and spin up the same service on a different machine as a backup. You could also do this with a physical server, but that could become costly if you account for multiple service. Pro tip, you can prevent a single point of failure on a physical machine if you have redundant servers set up, meaning you have duplicate servers as a backup. You will learn about backups in the upcoming module.

Network Services

FTP

- A network service that's commonly used in organization is a file transfer service.
- File Transfer Protocol. It's a legacy way to transfer files from one computer to another over the Internet.
- it doesn't handle data encryption
- FTP is primarily used today to share web content



- A network service that's commonly used in organization is a file transfer service. The FTP service works much like RSH service. Clients that want to access an FTP server have to install an FTP client. On the FTP

server, we install the software that allows us to share information located in the directory on that server.

- FTP is primarily used today to share web content. If you use a website host provider, you might see that they have an FTP connection already available for use so they can easily copy files to and from your web site.

SFTP

- Secure version of FTP
- data is sent through SSH and is encrypted.



- SFTP, it's a secure version of FTP, so it makes sense to choose this option over FTP. During this SFTP process, data is sent through SSH and is encrypted.

TFTP

- Trivial FTP
 - doesn't require user authentication
 - used to host installation files
 - keep operating system installation files in a TFTP server
 - PXE or PXE boot
 - preboot execution
 - allows you to boot into a software that's available over the network
- TFTP stands for trivial FTP. It's a simpler way to transfer files than using FTP.

NTP

- Network Time Protocol.
- used to keep the clock synchronized on machines connected to a network.
 - There are different ways that an IT support specialist or sysadmin can do this for an organization. You can use a local NTP server or a public NTP server. To set up a local NTP server, you can install NTP server software on your management server.
 - Then, you install NTP clients on your machines and tell those computers which NTP service to sync their time to. This is a great option because you can then manage the entire process from end to end. The other way to set up NTP is to use a public NTP server. Public NTP servers are managed by other organizations that your client machines connect to in order to get synchronized time.
 - This is an awesome way to utilize NTP without having to run a dedicated NTP server. But if you have a large fleet of thousands of machines, it's better etiquette to be running your own NTP servers. Another good practice is to run your own NTP server. Then, have that point to a public NTP server. This makes it so that you don't connect all your clients to a public NTP server, and you don't have to measure time synchronization.
 - Whether you run your own NTP server, or you use a public one, NTP is an important network service that you should definitely integrate into your own fleet.

Network Support Services

- An Intranet is an internal network inside a company.
 - documentation can be centrally located, teams can post news updates, employees can write in forums and start discussions and more
 - most commonly seen in large enterprises
- Proxy server acts as an intermediary between a company's network and the Internet

- company network traffic is kept private from the Internet
- An Intranet is an internal network inside a company. It's accessible if you're on a company's network. Intranets can provide a wide range of information, and are meant to improve productivity by giving employees a greater medium to share information. Think of it like the company's website, that's only accessible to people on the company network.
- On this site documentation can be centrally located, teams can post news updates, employees can write in forums and start discussions and more. Intranets are most commonly seen in large enterprises, and can be incredibly valuable tool for employee productivity.
- Another internal support service that's widely used is a proxy server. Proxy server acts as an intermediary between a company's network and the Internet. They receive network traffic and relay that information to the company network. This way, company network traffic is kept private from the Internet. The internet gets traffic through a Proxy server, but it doesn't know where it originally came from. It only knows the proxy. Proxy servers can also be used to monitor and log internal company network activity. They can be configured, so certain websites are filtered from being accessed.
- Proxy servers are useful for fighting privacy and security on the Internet, and regulating access inside a company. In the next few lessons, we'll talk about what are probably the most essential network services DNS and DHCP.

DNS

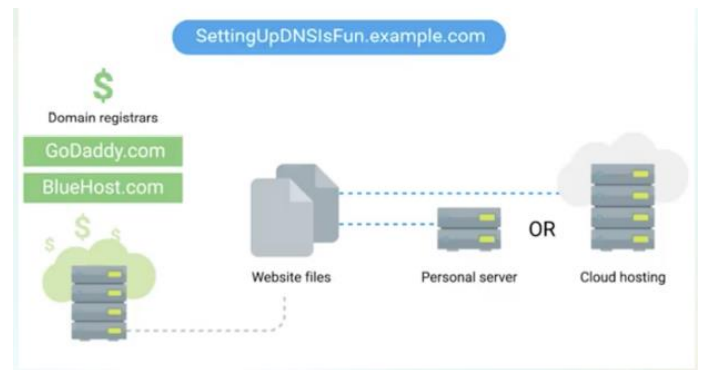
• Domain Name Service

- maps human understandable names to IP addresses.

• So why do you need to set up your own DNS service if DNS just works out of the box?

- If you're running a web service like a website, you want to be able to tell the Internet what IP address to reach your website at. To do that, you need to set up DNS.
- You probably want to work on your server or user machines remotely.

DNS for Web Servers



- You might remember that we can use a web server to store and serve content declines that request our services. We'll probably want to store website content on our web server. If clients want to reach our website, we need to set up DNS so that they can just type a URL to find us. So, let's talk about how DNS gets set up for a website. First, we need a domain name. We can buy a domain name like SettingUpDNSIsFun.example.com.
- We can purchase domain names like this from companies called domain registrars, like GoDaddy.com, or BluHost.com. Once we have our domain name, we want to point our website files to this domain name. Our website files can be stored on a cloud hosting provider, or we can decide to control this ourselves and store it on our own servers. Typically, domain registrars also provide cloud hosting services but they can charge you a monthly fee to host your web files for you.

- Protip, if you don't want to utilize cloud hosting services, you can just run your own web server. Don't forget, there are always pros and cons to hosting a service yourself or offshoring it somewhere else. If you're the sole IT support specialist for an organization, make sure to weigh all your options before committing to an infrastructure service. Let's assume that we do want to host our website files ourselves. From here, we still need to point our new domain name to where web content is located. We can do this in two ways.
- Most domain registrars can provide you with DNS settings and you can give the IP address of where your content is stored. If you decide not to use your domain registrar to host DNS for you, then you have to set up an authoritative DNS server for your website. Remember from our discussion in course 2 that authority DNS servers are the DNS servers that know exactly what the IP address is for the domain name. Since we own the domain name and host our web content ourselves, it makes sense for us to have the DNS servers that know that information.

DNS for Internal Networks



```

27.0.0.1 localhost
# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe80::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
/etc/hosts* BL, 204C 1.1 All

```

- The other reason we might want our own DNS servers is so we can map our internal computers to IP addresses. That way, we can reference a computer by name, instead of IP address. There are a few ways we can do this. One is using a local host file which contains

static IP addresses to hostname mappings. Let's take a look at an example of this. Remember, that we learned that hosts files and networking allows us to map IP addresses to hosts things manually.

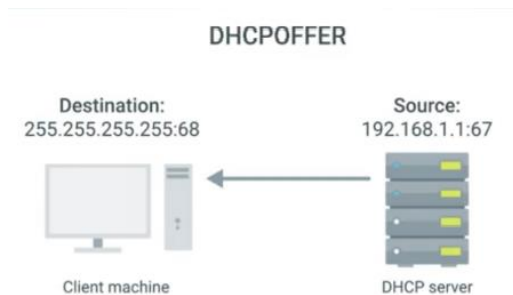
- In Linux, our host file is code etc/hosts. It has an IP address that points to 127.0.0.1 which points to a name called localhost. This just references back to the computer. Localhost is commonly used as a way to access a local web server. We'll talk about web servers in an upcoming module. So for now, let's not worry too much about localhost.
- Instead, if I change this IP address mapping to www.google.com, then save and open a web browser, and type www.google.com, it won't take me there. Let me show you that. So I'm going to go ahead and change my localhost to www.google.com. I'm going to save this. Open my web browser to www.google.com, and as you can see, it didn't take me anywhere.
- It just takes me back to my local computer. This is because a DNS query first, checks our local host file, then our local DNS servers. So, if there's an entry for google.com in my host file, you go to that IP address instead. Let's say I wanted to access Natalie's computer at 192.168.15 and her host name is catlady.examplecompany.com. I would have to enter this in my host file for every single computer in my fleet. That's definitely not a scalable option. So, what's our next choice? We can set up a local DNS server that contains all the organizations computer names mapped to their IP addresses. This is a more central storage location for this information. Then, we change our network settings for all our computers to use as DNS server instead of the one given to us by our ISP.
- Finally, let's look at one of the last DNS option we can use for an internal network. It can be integrated with a directory service which handles user and machine information

in its central location like, active directory and LDAP. Once we set up DNS in our directory service, it will automatically populate with machine to IP address mappings. So, there's no need to enter this information in manually. We'll talk more about these directory services in the later module. And voila, that's an overview of why you need the DNS along with your options for configuring them.

- We won't dive too deeply into the technical details of setting up a DNS server, but if you're interested in learning about which DNS software to use, there are a few powerful options like Bind or powerDNS. I bet you can guess where you can read more about them. In the supplemental reading. One thing about DNS, that we haven't discussed is what to do if we use something like DHCP, which doesn't use static IP addresses. Don't worry, we'll cover this in the next lesson.

DHCP

• Dynamic Host Configuration Protocol



- Another network service that will make you a job in IT support easier is DHCP, Dynamic Host Configuration Protocol. Either refresh on DHCP, just check out the DHCP lessons and networking course. When managing IT infrastructure, and you want to connect a computer on a network, you have two options. You can grant it a static IP address or give it a DHCP assigned IP address. When you use a static IP address, you have to keep track of every IP address you assign a

computer and manually entered in the network settings. If you enable DHCP, your computers will be leased an IP address from a DHCP server. They'll automatically get IP addresses, and you don't have to worry about manually setting addresses.

- If you ever decide you need to expand your IP address range, you don't have to change anything on the client machines either, it just happens automatically. To configure a DHCP server, you need to figure out which IP range you can use to assign IP addresses. If you want to integrate with DNS, you need the address of your local DNS servers. What Gateway you should assign, and the subnet mask that gets used. Once you solve the DHCP server software, you had to configure the settings with this information. Different DHCP server software manufacturers have different configuration setting layouts, so you have to investigate the specific one you want to use.
- There are a lot of popular DHCP server software you can use for this. Windows Server versions come with DHCP service built-in, but you can read more about the options in the next reading. Once you turn on your DHCP server and your client is set to receive DHCP addresses instead of static IP addresses, you should have working DHCP settings. In the last lesson, we talked about how DNS ties in with DHCP.
- Well now in a DHCP configuration settings, we can specify a DNS server locations. The two servers then sync up and when DHCP leases out new addresses, DNS updates IP address mappings automatically. That's a super quick overview how DHCP servers are configured. Hopefully you can now see why DHCP and DNS are critical network services for your organization.

1. Preboot Execution allows you to boot into a software that's available over the network.
 - **True**
 - False
2. TFTP does require user authentication
 - **False**
 - True
3. ____ gives a pre-configures virtual machines that you can use just as if your had a physical server.
 - **Infrastructure as a Service**
 - Software as a Service
 - Directory as a Service
 - Platform as a Service
 - Networking as a Service
4. Platform as a Service are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser.
 - True
 - **False**
5. Directory as a Service centralizes your organizations users and computers in one location so that you can add, update and remove users and computers.
 - Infrastructure as a Service
 - Networking as a services
 - **Directory as a Service**
 - Software as a Service
 - Platform as a Service
6. ____ is the process of creating a software-based, representation of something, such as virtual; applications, servers, storage and networks.
 - Realization
 - Simulation
 - **Virtualization**
 - Imitation
7. TFTP is used to host installation files
 - **True**
 - False
8. In ____, data is sent through SSH and is encrypted.
 - **SFTP**
 - FTP
 - NMTP
9. Server operating systems are usually more secure and come with additional; services already built in.
 - **True**
 - False
10. DHCP maps human understandable names to IP addresses
 - True
 - **False**
11. In a larger company, a single person could be responsible for all these services.
 - True
 - **False**
12. Internet is an internal network inside a company
 - **True**
 - False
13. ____ are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more all from a web browser.
 - Infrastructure as a Service
 - Networking as a services
 - Directory as a Service
 - **Software as a Service**
 - Platform as a Service
14. File Transfer protocol is a legacy way to transfer files from one computer to another over the internet.
 - False
 - **True**
15. ____ allows you to boot into a software that's available over the network.
 - **Preboot execution**
 - On-demand execution
 - Postboot execution
 - In-demand execution
16. With virtualized service, you can't quickly stop your service or migrate them to another physical server.
 - **False**
 - True
17. ____ maps human understandable names to IP addresses
 - DHCP
 - HTTP

- **DNS**
 - **FTP**
18. ____ is used to keep the clock synchronized on machines connected to a network.
- **FTP**
 - **SFTP**
 - **NTP**
 - **TFTP**
19. Which of these is considered a network service? Check all that apply.
- **DNS**
 - **Wireless internet**
 - **Ethernet cables**
 - **Blade Server**
20. TFTP doesn't require user authentication
- **True**
 - **False**

F2. 20/20

1. ____ doesn't require user authentication
- **FTP**
 - **NTP**
 - **SFTP**
 - **TFTP**
2. Management infrastructure services are what allows an organization to function.
- **True**
 - **False**
3. Intranet is an internal network inside a company
- **True**
 - **False**
4. ____ is a legacy way to transfer files from one computer to another over the internet
- **FTP**
 - **DHCP**
 - **NTP**
 - **DNS**
5. TFTP is used to host installation files
- **True**
 - **False**
6. In smaller companies, teams assist admins might manage just one service.
- **True**

- **False**
7. ____ allows companies to offshore their networking services so that they don't have to deal with the expensive networking hardware.
- **Infrastructure as a Service**
 - **Networking as a services**
 - **Directory as a Service**
 - **Software as a Service**
 - **Platform as a Service**
8. Networking as a Service allows companies to offshore their networking services so that they don't have to deal with the expensive networking hardware.
- **True**
 - **False**
9. Service operating systems are optimized for server functionality.
- **True**
 - **False**
10. Directory as a Service centralizes your organizations users and computers in one location so that you can add, update, and remove users and computers.
- **True**
 - **False**
11. In SFTP, data is sent through SSH and is encrypted
- **True**
 - **False**
12. ____ includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform.
- **Infrastructure as a Service**
 - **Networking as a services**
 - **Directory as a Service**
 - **Software as a Service**
 - **Platform as a Service**
13. NTP is used to keep the clock synchronized on machines connected to a network
- **True**
 - **False**
14. With virtualized service, you can quickly stop your service or migrate them to another physical server.
- **True**

- False
15. Platform as a Service are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser.
- **True**
 - False
16. ____ is used to keep the clock synchronized on machines connected to a network.
- FTP
 - SFTP
 - **NTP**
 - TFTP
17. TFTP does require user authentication
- True
 - **False**
18. DHCP leases IP addresses to clients
- **True**
 - False
19. Postboot Execution allows you to boot into a software that's available over the network.
- **True**
 - False
20. With virtualized service, you can't quickly stop your service or migrate them to another physical server.
- **False**
 - True
-

F2 19/20

TFTP does require user authentication

- **False**

In smaller companies, teams assist admins might manage just one service

- **False**

In a larger company, a single person could be responsible for all these services.

- **False**

TFTP doesn't require user authentication

- **True**

_____ is a legacy way to transfer files from one computer to another over the Internet

- DHCP
- DNS
- NTP
- **FTP**

Directory as a Service includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform

- **False**

It's cheaper to run several services on one machine than it is to run many services on multiple machines

- **Virtualization**

When you virtualize a server, you're putting lots of virtual instances on one server. Each instance contains a service.

- **True**

It's cheaper to run several services on one machine than it is to run many services on multiple machines

- **True**

Directory as a Service centralizes your organizations users and computers in one location so that you can add, update, and remove users and computers

- **True**

DNS leases IP addresses to clients

- **False**

NTP is used to keep the clock synchronized on machines connected to a network

- **True**

_____ gives a pre-configured virtual machines that you can use just as if you had a physical server

- Software as a Service
- Platform as a Service
- **Infrastructure as a Service**

- Networking as a Service
- Directory as a Service

In SFTP, data is sent through SSH and is encrypted

- **True**

Platform as a Service are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser

- **True**

Server operating systems are optimized for server functionality.

- **True**

Management infrastructure services are what allows an organization to function.

- **False**

Virtualization is the process of creating a software-based, representation of something, such as virtual applications, servers, storage and networks

- **True**

DHCP leases IP addresses to clients

DNS

FTP

DHCP

HTTP

_____ is the process of creating a software-based, representation of something, such as virtual applications, servers, storage and networks

- Realization
- Imitation
- Simulation
- **Virtualization**

Software as a Service allows companies to offshore their networking services so that they don't have to deal with the expensive networking hardware

- **False**

(di pa natatama)

FORMATIVES

19/20

1. FTP does handle data encryption **[FALSE]**
2. ____ is used to keep the clock synchronized on machines connected to a network **[NTP]**
3. It's cheaper to run several services on one machine than it is to run many services on multiple machines **[TRUE]**
4. DHCP leases IP addresses to clients **[FALSE] – True ata to eto lang di ko sure the rest tama na kasi**
5. With virtualized service, you can quickly stop your service or migrate them to another physical server **[TRUE]**
6. Server operating systems are usually more secure and come with additional services already built in **[TRUE]**
7. NTP is legacy way to transfer files from one computer to another over the Internet **[FALSE]**
8. Directory as a Service centralizes your organizations users and computers in one location so that you can add, update, and remove users and computers **[TRUE]**
9. DNS maps human understandable names to IP addresses **[TRUE]**
10. Software as a Service are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser **[TRUE]**
11. ____ is used to host installation files **[TFTP]**
12. Internet is an internal network inside a company **[FALSE]**
13. It's more expensive to run several services on one machine than it is to run many services on multiple machines **[FALSE]**

14. ____ allows you to boot into a software that's available over the network **[PREBOOT EXECUTION]**
15. NTP is used to host installation files **[FALSE]**
16. In smaller companies, teams assist admins might manage just one service **[FALSE]**
17. NTP is used to keep the clock synchronized on machines connected to a network **[TRUE]**
18. IT infrastructure services are what allows an organization to function **[TRUE]**
19. In ____, data is sent through SSH and is encrypted **[SFTP]**
20. TFTP does require user authentication **[FALSE]**
-

17.33/20

1. Which of the following is considered a physical infrastructure service? Check all that apply.
- **Laptop**
 - Operating systems
 - **Desktop**
 - **Rack server**
2. Management infrastructure services are what allows an organization to function. **[FALSE]**
3. In smaller companies, teams assist admins might manage just one service **[FALSE]**
4. In ____, data is sent through SSH and is encrypted **[SFTP]**
5. Platform as a Service includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform **[TRUE]**
6. In SFTP, is sent through SSH and is encrypted **[TRUE]**
7. DNS leases IP addresses to clients **[TRUE]**
8. Server operating systems are usually more secure and come with additional services already built in **[TRUE]**
9. Which of these is considered a network service? Check all that apply.
- **DNS**
 - **Ethernet cables**
 - **Wireless Internet**

- Blade server
10. NTP is used to host installation files **[FALSE]**
11. ____ includes an entire platform that allows you to build code, store information in a database, and serve your application from a single platform **[PLATFORM AS A SERVICE]**
12. FTP does handle data encryption **[FALSE]**
13. With virtualized service, you can't quickly stop your service or migrate them to another physical server **[FALSE]**
14. ____ gives a pre-configured virtual machines that you can use just as if you had a physical server **[INFRASTRUCTURE AS A SERVICE]**
15. Platform as a Service are services that you can purchase that allow you to edit word documents, process spreadsheets, make presentations and more, all from a web browser **[FALSE]**
16. DHCP maps human understandable names to IP addresses **[FALSE]**
17. TFTP doesn't require user authentication **[TRUE]**
18. Simulation is the process of creating a software-based, representation of something, such as virtual applications, servers, storage and networks **[FALSE]** **{wala to sa module sinearch ko lang sa net lumabas VIRTUALIZATION}**
19. Software as a Service allows companies to offshore their networking services so that they don't have to deal with the expensive networking hardware **[FALSE]**
20. TFTP does require user authentication **[FALSE]**
-