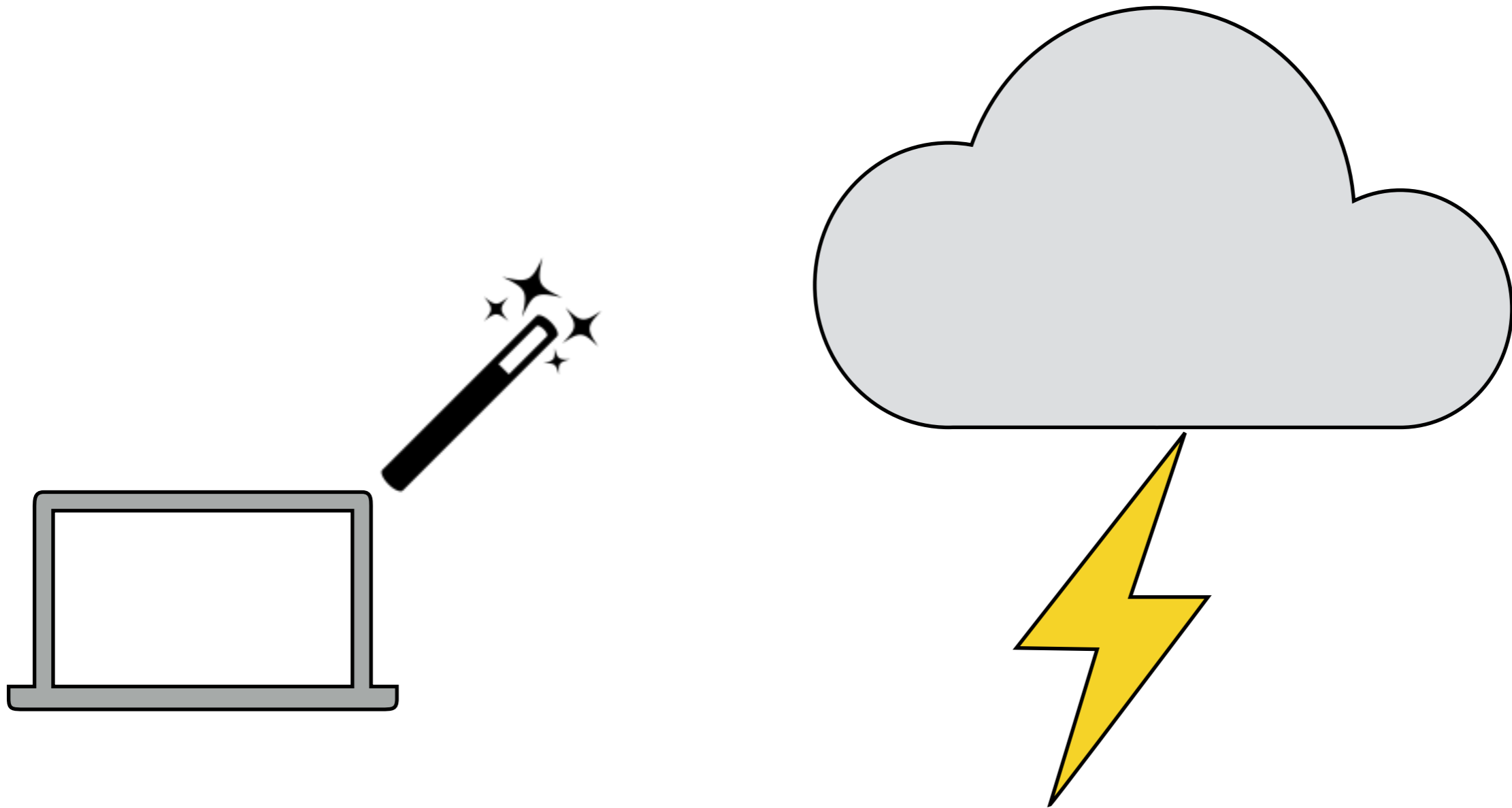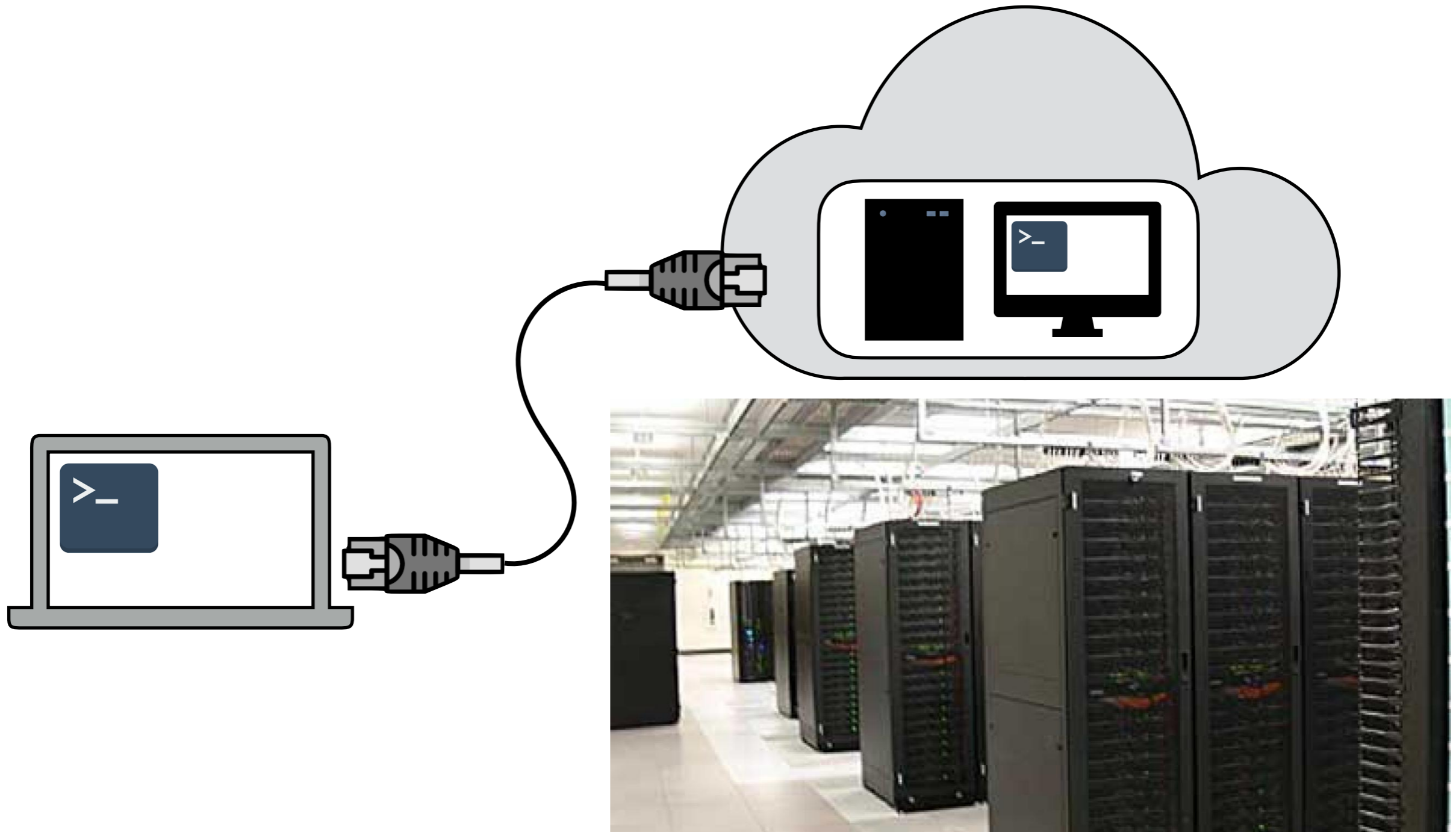vedb $ Module ='Remote Computing:
Virtual Machines and Remote Access'
vedb $ Class = 'Elements of Research Computing'

...

Mark D. Lescroart, Ph.D.

What is this "cloud" of which you speak?

What is this "cloud" of which you speak?

Remote access at UNR and Network security

UNR border firewall

WolfCloud
(virtual machines)
<name>.acs.unr.edu

Pronghorn
(High Performance
Computing)
<name>.rc.unr.edu

UNR campus
buildings

[Specific
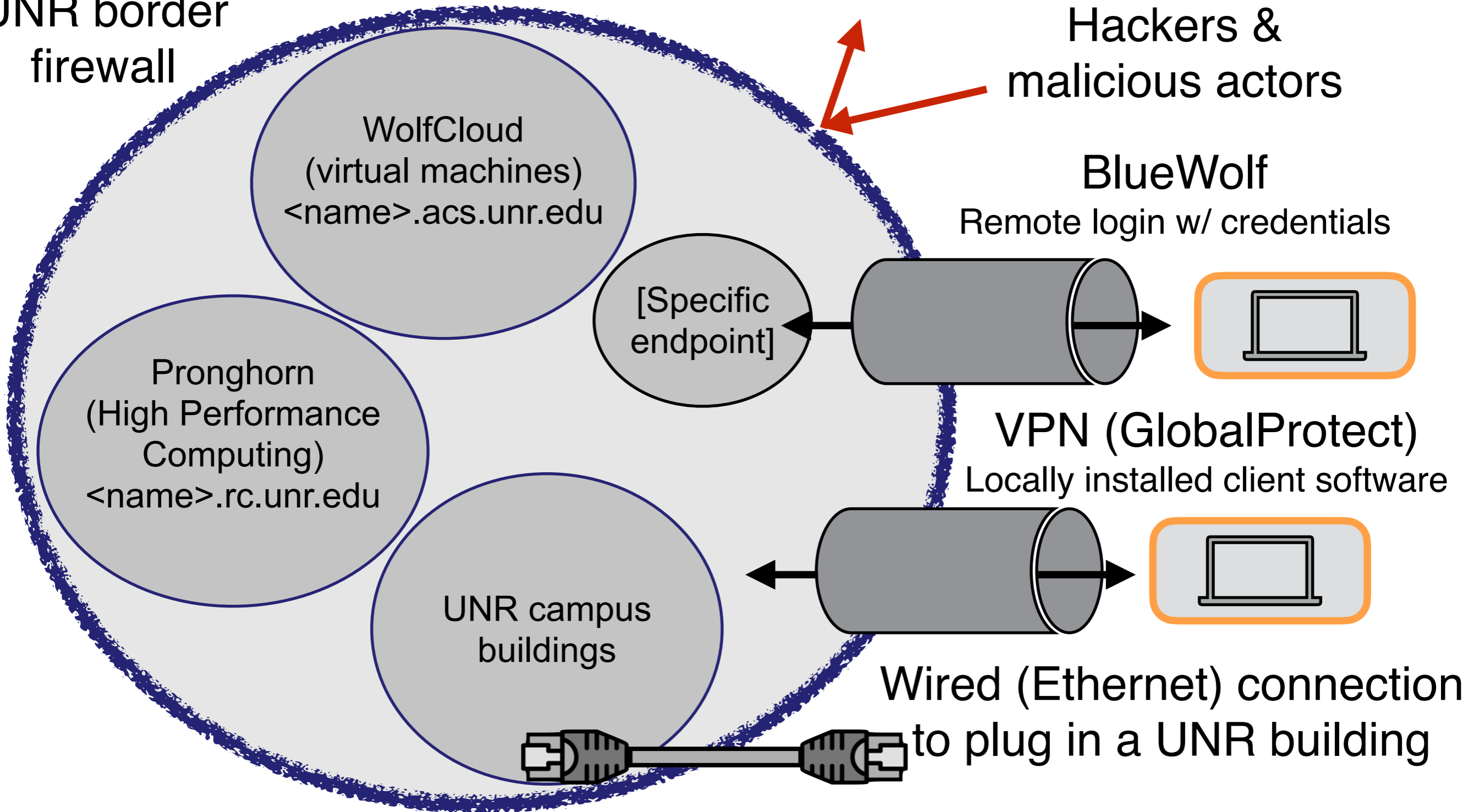endpoint]

Hackers &
malicious actors

BlueWolf
Remote login w/ credentials

VPN (GlobalProtect)
Locally installed client software

Wired (Ethernet) connection
to plug in a UNR building

Remote computing terminal commands

Basic operations you want to perform:

Am I connected? Can I contact a computer or website?

ping

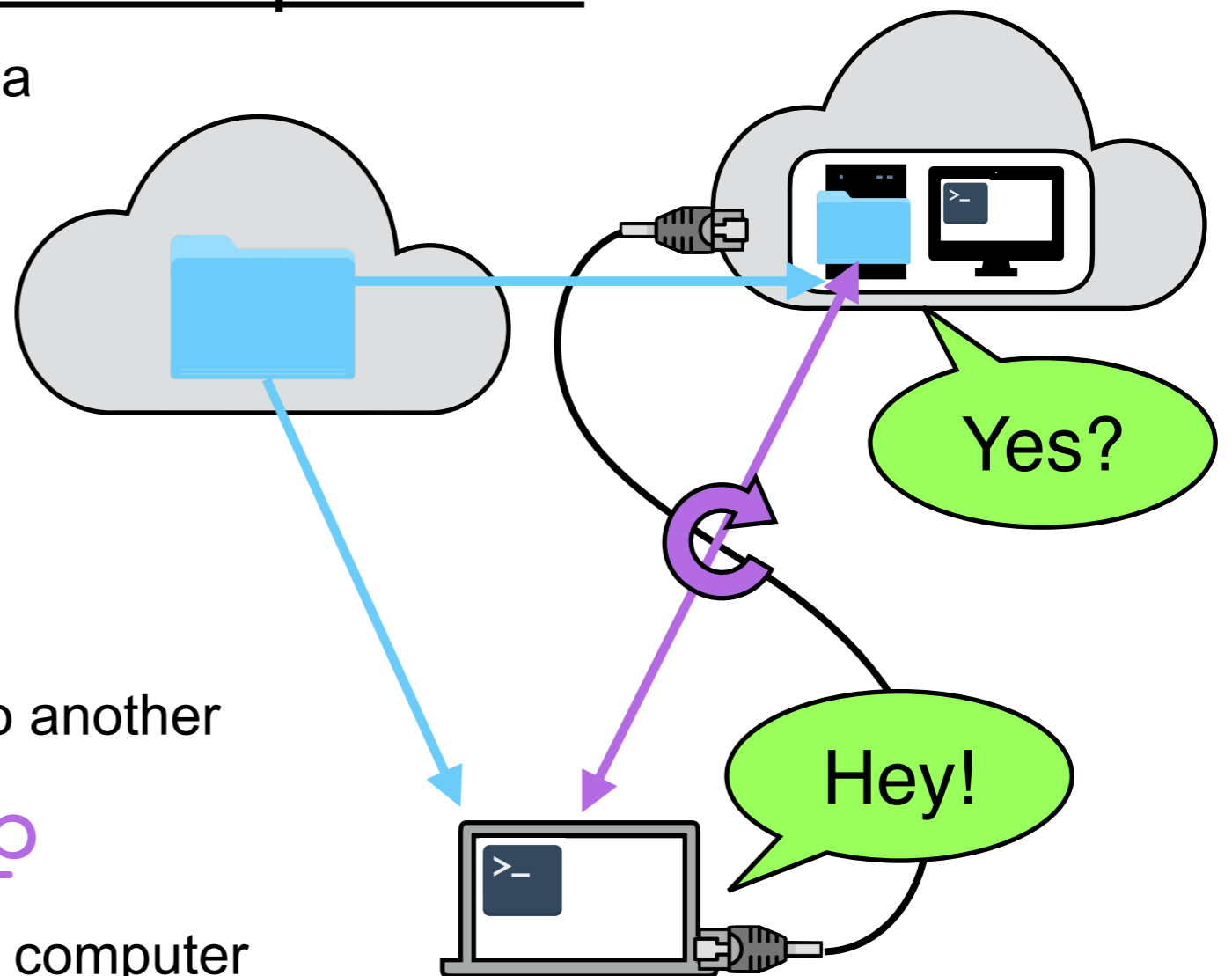Log in to a remote computer (with some form of credentials)

ssh

Copy files from one computer to another

rsync or scp

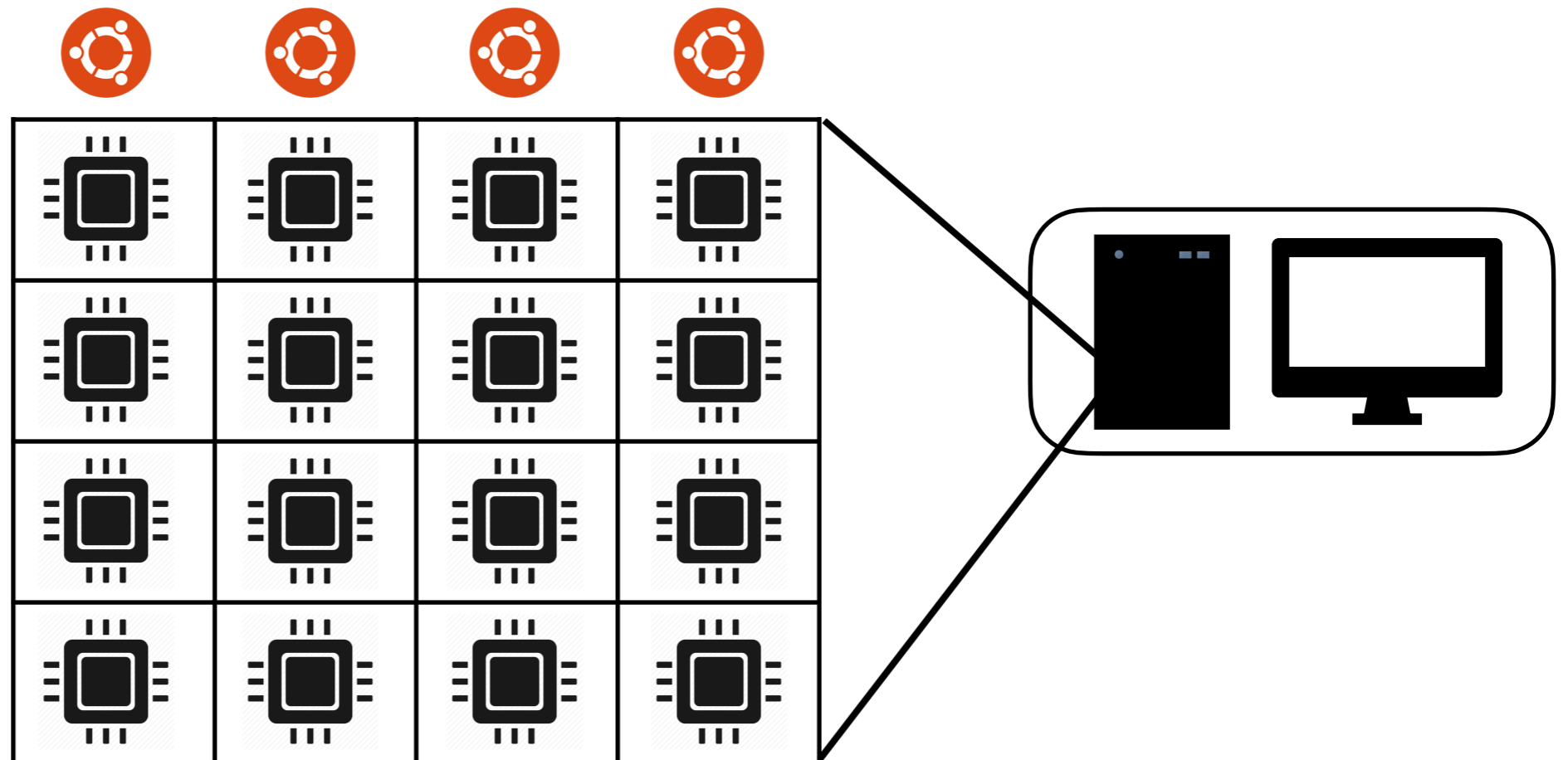Copy files from the internet to a computer

wget

Yes?

Hey!

[Live demo of login]

Virtual machines:
A cartoony example

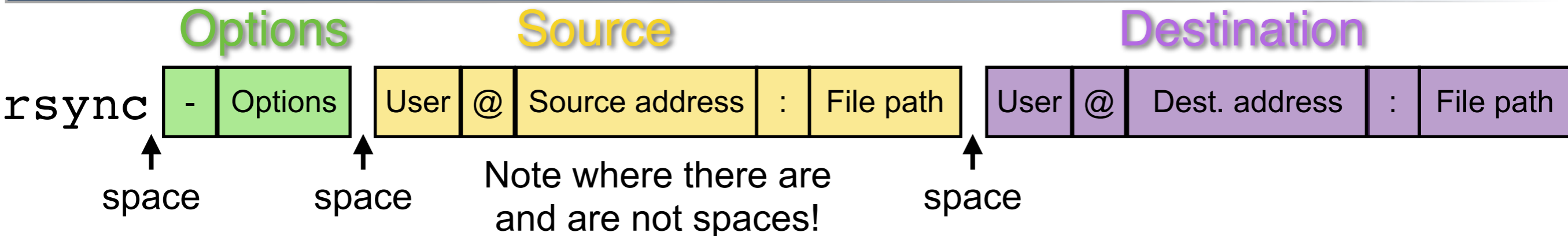CPU has 16 cores and 64 of RAM

Image if you could install 4 separate operating systems on this computer, each with 4 CPU cores devoted to it and 16 GB of ram

Parts of scp / rsync commands
(rsync will be used as an example, but nearly all is the same for scp)

Options   **Source**   **Destination**

`rsync` | - | Options | | User | @ | Source address | : | File path | | User | @ | Dest. address | : | File path

↑ space   ↑ space   ↑ space

Note where there are and are not spaces!

All of these parts do NOT have to be entered for every call! Specifically, you CAN'T have a remote address for both the source and the destination. `rsync` calls must have ONE of these formats:

Copy files from a remote computer to the current computer:

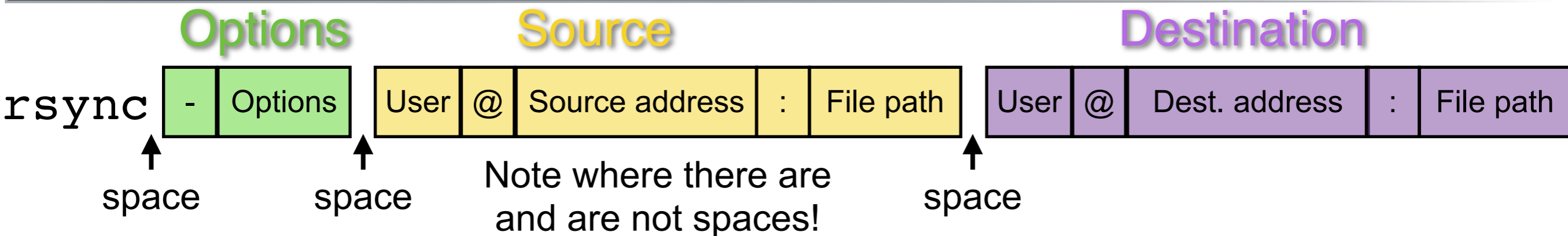`rsync` | - | Options | | User | @ | Source address | : | File path | | (Local!) File path

Copy files from the current computer to a remote computer:

`rsync` | - | Options | | (Local!) File path | | User | @ | Dest. address | : | File path

Copy files from one directory to another on the same computer:

`rsync` | - | Options | | (Local!) File path | | (Local!) File path

Parts of rsync commands

rsync	Options		Source					Destination				
	-	Options	User	@	Source address	:	File path	User	@	Dest. address	:	File path

↑ space   ↑ space   Note where there are and are not spaces!   ↑ space
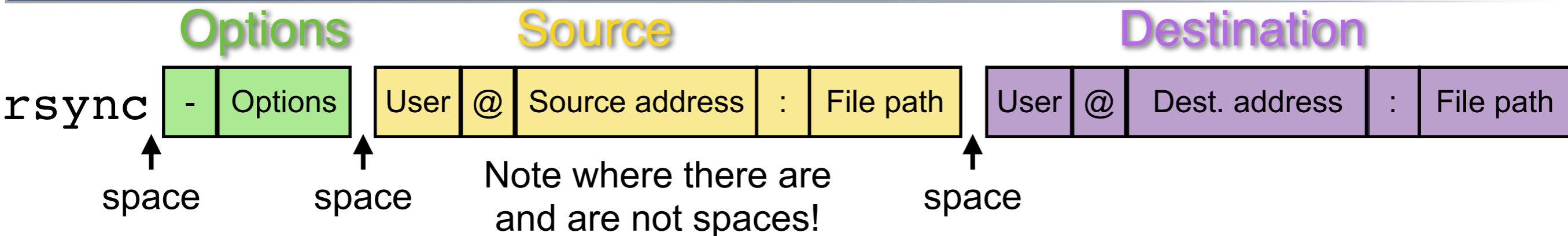
Here is an example call to copy a directory called "data-folder" from a local computer to a virtual machine. It copies the folder "data-shell" and its contents ("-r" option) up to the bdss_student home directory on virtual machine called "bdss_node_party". Note that the DESTINATION (purple) is remote - so the full address has to be provided (including ".acs.unr.edu" and the remote folder, "~/")

```
rsync -r data-folder bdss_student@bdss_node_party.acs.unr.edu:~/
uploads/
```

rsync	-	Options	(Local!) File path	User	@	Dest. address	:	File path

Note that this must be called from a terminal running on becca's LAPTOP.

Parts of rsync commands

rsync	Options		Source					Destination				
	-	Options	User	@	Source address	:	File path	User	@	Dest. address	:	File path

↑ space ↑ space ↑ space

Note where there are and are not spaces!

Here is an example call to copy files from a laptop to the Pronghorn login node. This is for a hypothetical person whose login is "becca". It copies the folder "data-shell" and its contents ("-r" option) up to becca's home directory on Pronghorn. On Mac terminals, you can specify the home directory as "~/" , but on Windows (at least on mobaxterm) you have to spell out the full home directory as is done here:

`rsync -r data-shell becca@pronghorn.rc.unr.edu:/data/gpfs/home/becca/`

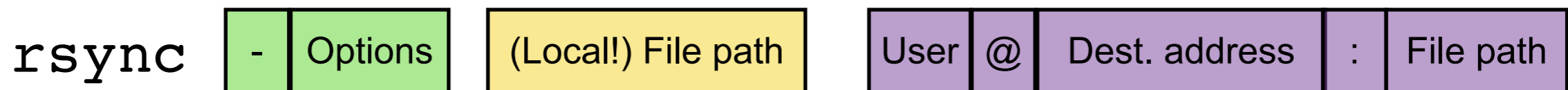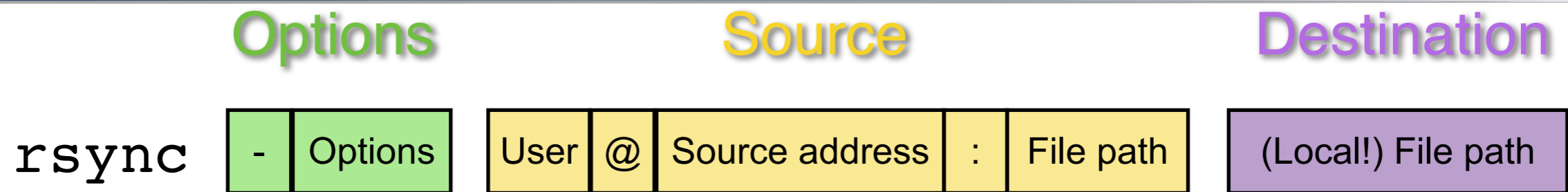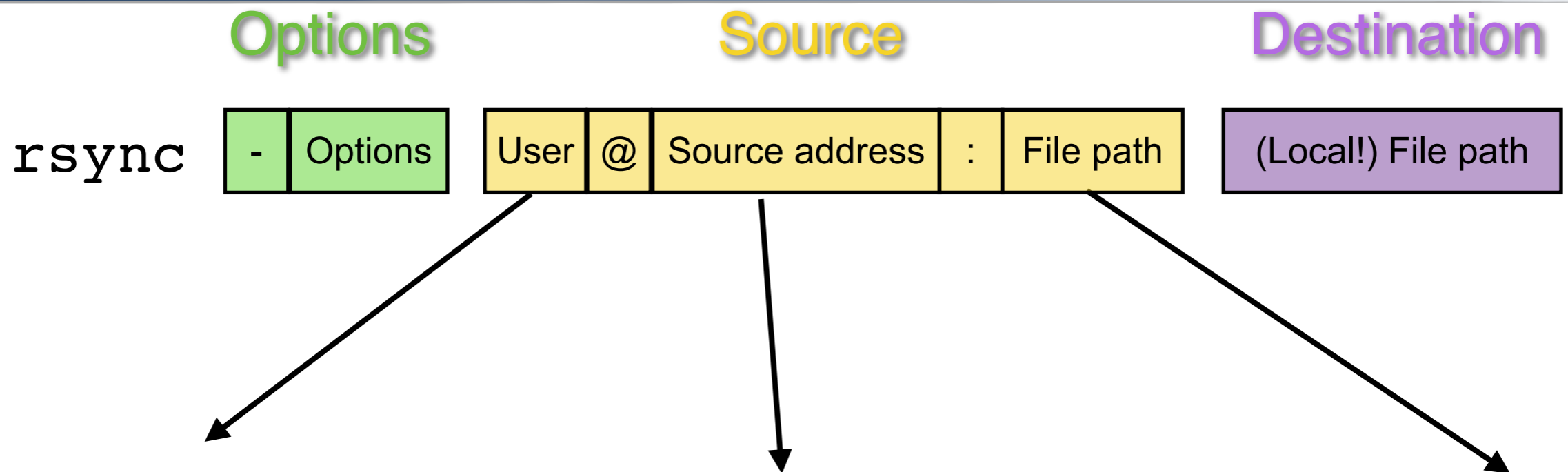| rsync	-	Options	(Local!) File path	User	@	Dest. address	:	File path

Note that this must be called from a terminal running on becca's LAPTOP.

Details of parts of rsync commands

`rsync` | - | Options | | User | @ | Source address | : | File path | | (Local!) File path |

One of the most common options used is *-r* which makes the copy operation *recursive*, meaning it includes everything in a directory. This isn't necessary for single files, only for directories (won't hurt, just not necessary)

Details of parts of rsync commands

Options   **Source**   **Destination**

`rsync` | - | Options | | User | @ | Source address | : | File path | | (Local!) File path |

The user depends on the machine you are logging into. e.g. to copy to or from Pronghorn*, use your NetID as the user (and of course your NetID password, when prompted). For other machines, this will be the user name you use on that machine, and the associated password.

The source address is the (permanent) web address of the computer to which or from which you want to copy files. This will be e.g. pronghorn.rc.unr.edu or bdss_node_00.acs.unr.edu. Note that your laptop (in general) does NOT have a permanent web address. Thus, if you are on a remote machine, you can't copy things from there TO your laptop, because you can't specify the destination address for your laptop!
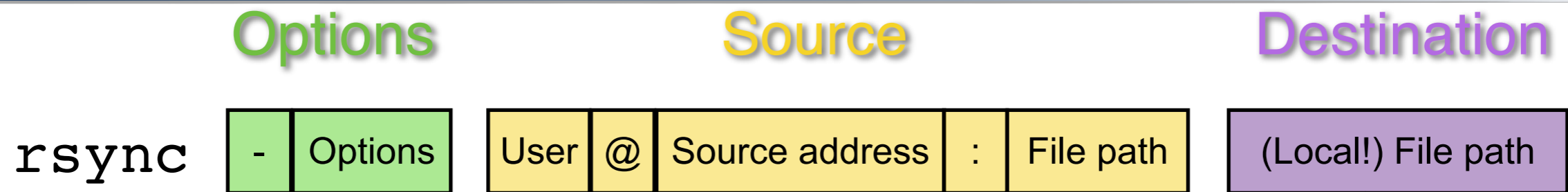
This file path specifics a location on the remote machine from which you want to copy a file. It can be from the home directory (~/some_folder), or from some other location (/wherever/you/want)

Details of parts of rsync commands

Source   Destination

`rsync` | - | Options | | User | @ | Source address | : | File path | | (Local!) File path |
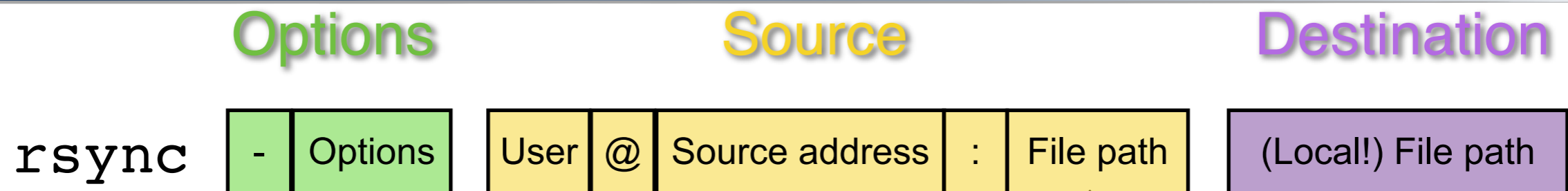
Quick note for Windows / mobaxterm users: the ~/ shortcut for your home directory may not work for you. You may have to type out the full home directory name, e.g. /home/becca/ (on a VM) or /data/gpfs/home/becca/ on pronghorn.

Details of parts of rsync commands

Options **Source** **Destination**

`rsync` | - | Options | User | @ | Source address | : | File path | (Local!) File path

This is the local file path on the current computer (whatever computer rsync is being called from). This can be ./ (note that that is dot-slash "./") for the current directory) or ~/ for your home directory, or /maybe/a/fully/specified/path if you want. It can also be a relative path, e.g. my_folder/ to copy the remote folder INTO a folder called "my_folder" that lives in the current directory from which you are calling rsync.

More examples

Called on Becca's laptop - Copies '**data-shell**' folder and all its contents from the local folder data-shell on the current computer (Becca's laptop) to the home directory for bdss_student on the bdss_node_25 virtual machine.

```
becca@home $
rsync -r data-shell bdss_student@bdss_node_25.acs.unr.edu:~/
```

Called on Becca's home directory on bdss_node_25 - Copies '**my_image.png**' from home directory (i.e., the current directory) to a directory called Images in the home directory on the virtual machine.

```
[becca@login-0 ~] $
rsync my_image.png bdss_student@bdss_node_25.acs.unr.edu:~/Images/
```

Called on Becca's laptop - Copies '**results**' folder and all its contents from Becca's home directory on the Pronghorn login to a folder called "summer_school" in the Documents folder on the local computer (here, Becca's laptop). Top one is legible (big font); bottom one is all one line to make spacing and syntax clear for this hypothetical example.

```
becca@home $
rsync -r becca@pronghorn.rc.unr.edu:/data/gpfs/home/becca/results
                ~/Documents/SummerSchool/
```

Remote access at UNR and Network security

Indicates rsync connections

UNR border firewall

The Pronghorn login node is the only gateway to ssh in to or rsync files out of the UNR network.

Pronghorn
(High Performance Computing)
<name>.rc.unr.edu

WolfCloud
(virtual machines)
<name>.acs.unr.edu

ssh

UNR campus buildings

ssh