RIT | Golisano College of Computing and Information Sciences
School of Information

NSSA221 Systems Administration I
Lab 1: Virtualization & Network Bootstrap

INTRODUCTION

In this lab you will stand up a small, self-contained virtual infrastructure on a Windows 11 bench computer using VMware Workstation Pro 17. You'll configure a pfSense router to isolate and NAT your private network, and you will deploy Windows Server 2025, Windows 11, and Rocky Linux virtual machines. You'll assign hostnames and static IP addresses, verify connectivity, and capture evidence for your report.

LAB SUMMARY

You will create linked clones from lab-provided base images, place VMs on a dedicated LAN segment, and configure networking end-to-end. pfSense will provide a routed gateway to the internet (via NAT), while all guests (Windows Server 2025, Windows 11, and Rocky Linux) will receive static addresses on the private segment. You will verify network settings and document results with legible screenshots.

IMPORTANT

Work from the **D: drive** only. **Do not modify base images.** Create linked clones for all VMs unless your instructor explicitly directs otherwise. Do not store VMs on cloud sync folders (risk of corruption).

GOALS

By the end of this lab, you will be able to:

- Use VMware Workstation Pro 17 to create linked clones from base images.
- Build a custom LAN segment and attach VMs appropriately.
- Configure pfSense with separate WAN (NAT) and LAN (static) interfaces.
- Manually assign static IPv4 settings and hostnames on Windows 11, Windows Server 2025, and Rocky Linux.
- Validate connectivity and configuration via platform-appropriate commands and capture compliant screenshots.

PREREQUISITES

- The bench computer running Windows 11 with VMware Workstation Pro 17 installed.
- Access to the following base images in the VMware library: pfSense (provided), Windows Server 2025, Windows 11, and Rocky Linux.
- Local storage on D: (Thawspace) for working copies of VM folders.
- Internet access from the bench machine.

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ACTIVITY SUMMARY

Activity 1: Deploy pfSense and create the virtual LAN segment.

Activity 2: Deploy Windows Server 2025 and configure static networking.

Activity 3: Deploy Windows 11 and Rocky Linux, configure hostnames and static networking.

Activity 4: Clean up and back up linked clones.

ACTIVITY 1: DEPLOY PFSENSE AND CREATE THE LAN SEGMENT

INTRODUCTION

pfSense will route between your private LAN segment and the outside world. You will give it two NICs: one facing outward (NAT) and one facing inward (LAN with a static address that becomes the default gateway for your other VMs).

PROCEDURE

1. Prepare folders on D:
   Create a folder per VM under D:\VMs\<your-choice>. Keep VM names and folder names meaningful (e.g., gateway, win-srv-2025, win11, rocky).
2. Create a linked clone of pfSense
   In VMware Workstation, single-click the pfSense base image in the library → **Manage** → **Clone** → **The current state in the virtual machine** → **Create a linked clone**. Name it gateway (or similar) and save to your D:\VMs\gateway folder.
3. Power on pfSense and let it boot to the console menu.
4. Configure NICs in VMware
   - Edit VM **Settings** → Ensure **two** adapters exist.
   - **Adapter 1** (WAN): set NAT (VMware NAT). You do not need to assign an IP address to this interface. It will be obtained via DHCP.
   - **Adapter 2** (LAN): set LAN segment → LAN Segments… → Add… Create a new segment (e.g., Net01). Select your new segment for Adapter 2.
   - Record each adapter's **MAC address** (Advanced) so you can match them to pfSense interfaces.
5. **Assign interfaces in pfSense**
   On the pfSense console: **1) Assign Interfaces** → **No** to VLANs → set **WAN** to the NIC whose MAC is attached to **NAT**, and **LAN** to the NIC on your **LAN segment**. Confirm.
6. **Set the LAN IP**
   From the console menu choose **2) Set interface(s) IP address** → select the LAN interface → assign a static address (e.g., 192.168.1.254/24).

- **Do not** enable DHCP on LAN (you'll configure DHCP later in Windows Server labs).
- Skip IPv6.
- If prompted about HTTP/HTTPS for the webConfigurator, HTTP is acceptable for this isolated lab environment.

7. **Verify** both interfaces show expected addressing on the pfSense console menu.

CONCLUSION

pfSense is now the default gateway for your LAN segment with outward access via VMware NAT and inward access on your private segment. You will use the LAN IP (e.g., 192.168.1.254) as the default gateway for all guest VMs.

DELIVERABLE

For the report, include a screenshot titled **Figure 1 – pfSense Dashboard** (accessed later from a browser) showing the **version** and the visible **LAN** and **WAN** addresses.

ACTIVITY 2: DEPLOY WINDOWS SERVER 2025

INTRODUCTION

For this activity, you'll deploy Windows Server 2025 as your future AD/DNS/DHCP server (Lab 2). For now, you'll attach it to the LAN segment and configure static IPv4 settings.

PROCEDURE

8. **Create a linked clone** of the **Windows Server 2025** base image → save to `D:\VMs\win-srv-2025`.
9. **Attach NIC** to your **LAN segment** created in Activity 1.
10. **Log in** (student/student) and set a **static IPv4** configuration. Example (adjust to your plan):
    - IP: `192.168.1.2`
    - Prefix: `/24`
    - Gateway: **pfSense LAN** (e.g., `192.168.1.254`)
    - DNS: (Primary) the server itself (or loopback), (Secondary) a resolver such as RIT `129.21.3.17` or `8.8.8.8`.
11. **Verify** connectivity (e.g., ping pfSense LAN IP; browse to pfSense at `http://<pfSense-LAN-IP>/`).

CONCLUSION

Windows Server 2025 is attached to the private LAN and statically addressed, ready for role configuration in later labs.

DELIVERABLE

For the report Include a screenshot titled **Figure 2 – Windows Server 2025 Information** showing the full output of: Get-Date; ipconfig /all.

ACTIVITY 3: DEPLOY WINDOWS 11 AND ROCKY LINUX

INTRODUCTION

For this activity, deploy the client OSes, set hostnames, and configure static IPv4 addresses.

PROCEDURE

ROCKY LINUX

12. **Create a linked clone** of the **Rocky Linux** base image → save to `D:\VMs\rocky`.
13. **Attach NIC** to your **LAN segment**.
14. **Set hostname** (replace with your own FQDN; **use your RIT username** for the domain suffix, **not the example**):

```
sudo su -
hostnamectl set-hostname <the FQDN for your system>
hostnamectl
```

15. **Assign static IPv4 with nmcli** (adjust addresses to your plan):

```
nmcli connection edit ens192 # or your system's interface name
set ipv4.addresses 192.168.X.X/24
set ipv4.gateway   192.168.X.X
set ipv4.dns       8.8.8.8
save
quit
nmcli
```

16. **Capture** output for your screenshot (this will be a deliverable):

```
date; hostname; ip addr
```

WINDOWS 11

17. Create a linked clone of the Windows 11 base image → save to D:\VMs\win11.
18. Attach NIC to your LAN segment.
19. Rename computer (hostname only; FQDN comes later):

```
Rename-Computer -NewName <hostname>
```

20. Using PowerShell (boo GUI). **Note:** The backtick (`) is the **line-continuation** character; it is **not** part of the parameter values and must be the **last** character on the line."[1]


```
Get-NetAdapter

New-NetIPAddress -InterfaceIndex 7 `
-IPAddress 192.168.1.3 `
-PrefixLength 24 `
-DefaultGateway 192.168.1.X

Set-DnsClientServerAddress `
-InterfaceIndex 7 `
-ServerAddresses ("8.8.8.8","8.8.4.4")
```

21. Capture output for your screenshot.

```
Get-Date; ipconfig /all
```

CONCLUSION

All three guest systems (pfSense, Windows Server 2025, Windows 11, and Rocky Linux) are statically addressed on the private LAN and identified by hostnames. Your starting infrastructure is ready to go for Lab 2.

DELIVERABLE

Figure 3 – Rocky Linux Information (date; hostname; ip addr output visible).

Figure 4 – Windows 11 Information (Get-Date; ipconfig /all output visible).

ACTIVITY 4: CLEANING UP

INTRODUCTION

Return the bench system to a ready state and secure your work.

PROCEDURE

1. Gracefully shut down all VMs.

[1] https://learn.microsoft.com/en-us/powershell/module/microsoft.powershell.core/about/about_parsing?view=powershell-7.5#line-continuation

2. Back up linked clones (copy VM folders) to a fast external SSD (preferred). Or use the lab filer (\\files.istlabs.rit.edu) only if you have no external drive. As a last option, upload to cloud storage (i.e., Google Drive).
3. Empty Recycle Bin.
4. Reboot the bench computer.

CONCLUSION

Your bench system is ready for the next student and your VM work is safely backed up.

SCREENSHOT & SUBMISSION REQUIREMENTS

- Screenshots must be **legible and unaltered**; missing or unreadable evidence may receive **0 points** for that item.
- If you cannot obtain a screenshot due to a **specific, documented technical issue**, include a concise written explanation and your **troubleshooting steps (commands run, error messages, fixes attempted)** to be eligible for **up to 50%** credit for that item.
- **Not acceptable:** statements such as "I ran out of time" or "I couldn't get it to work" will receive **0 points**.

Required Figures

Figure 1 – pfSense Dashboard (version visible, LAN IP visible).

Figure 2 – Windows Server 2025 Information (Get-Date; ipconfig /all).

Figure 3 – Rocky Linux Information (date; hostname; ip addr).

Figure 4 – Windows 11 Information (Get-Date; ipconfig /all).

CONCLUSION

By completing this lab, you set up a functional, isolated virtualization environment on the Windows 11 bench PC: a pfSense gateway performing NAT between a private LAN segment and the lab network, plus three guests—Windows Server 2025, Windows 11, and Rocky Linux—each with hostnames and static IPv4 addressing. You validated connectivity with platform-appropriate tools and captured verifiable evidence.

This foundation prepares you for the next labs: promoting Windows Server 2025 to Active Directory Domain Services, standing up DNS/DHCP, domain-joining clients, and introducing centralized name resolution and authentication. The habits you practiced here—working on D:\ (Thawspace), using linked clones (not modifying base images), re-creating **LAN segments** per bench PC, and submitting **clear, legible screenshots**—are required in every subsequent lab.

NOTES & TIPS

The pfSense LAN default is often 192.168.1.1. This lab's examples use .254 as a common gateway address—either is acceptable if you are consistent across VMs.

The LAN segment you create in VMware is **local to the bench PC**. Because the lab machines are persistent images, you will re-create the LAN segment on each machine you use.

When in doubt, verify **interface names** (ens192 on Rocky is common) and **adapter indices** (Get-NetAdapter on Windows).

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RUBRIC

Criterion	Exemplary (Full)	Proficient (−2 to −5)	Developing (−6 to −10)	Incomplete (0)	Points
Figure 1 – pfSense Dashboard	Version and **LAN IP** clearly visible; WAN/LAN status consistent with plan; evidence unambiguous.	Minor crop/element missing, but LAN IP and version clear.	Evidence present but key errors (wrong IP/netmask/gateway) or LAN segment misconfigured.	Missing/illegible or generic excuse.	**0–20**
Figure 2 – Windows Server 2025 Information	Get-Date; ipconfig /all shows **static IP (/24)**, **gateway = pfSense LAN**, **DNS** set per instructions; hostname correct.	Minor omission (e.g., timestamp or secondary DNS).	Wrong addressing or DHCP in use; hostname/adapter mismatch.	Missing/illegible.	**0–20**
Figure 3 – Rocky Linux Information	date; hostname; ip addr shows correct hostname, interface, static IP; consistent with plan.	Minor omission (e.g., missing date).	Wrong addressing or NetworkManager config not applied; hostname not set.	Missing/illegible.	**0–20**
Figure 4 – Windows 11 Information	Get-Date; ipconfig /all shows correct static IPv4, gateway, DNS; hostname matches.	Minor omission.	Wrong addressing/DHCP; incorrect gateway/DNS.	Missing/illegible.	**0–20**
Documentation & Compliance	All figures titled exactly; screenshots **legible**; work performed on **D:**; **linked**	One–two minor formatting/naming issues.	Multiple issues (e.g., cloud storage used, base image	**Not acceptable** statements (e.g., "ran out of time/	**0–**

	clones used; **LAN segment** created; brief notes for any deviations; troubleshooting steps provided for any technical issue.		modified, unclear captions).	couldn't get it to work") or no troubleshooting.	