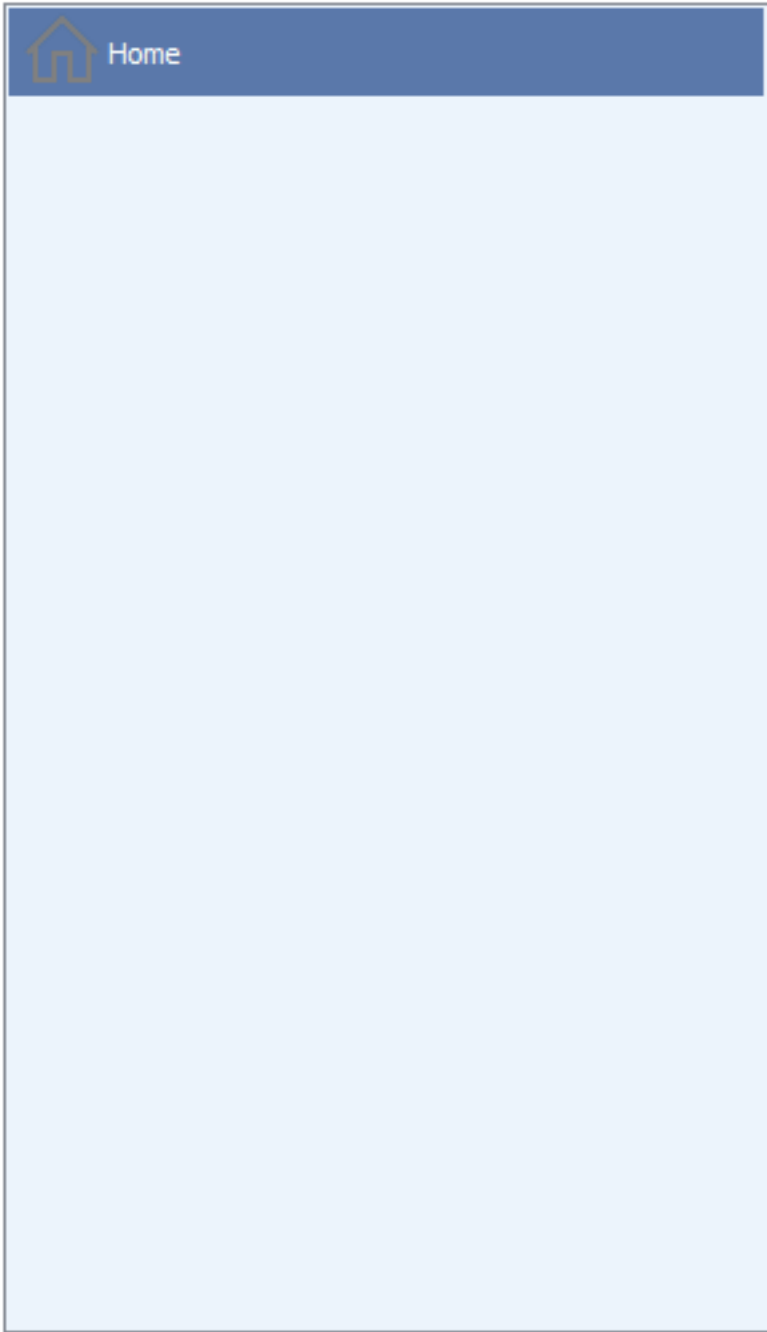



Internal VM Network and Router Build


The presentation builds a pfsense router and creates an internal network. The presentation does not show the configuration of NAT/PAT.


Preuss
10/16/2022





Welcome to VMware Workstation 16 Player

 **Create a New Virtual Machine**
Create a new virtual machine, which will then be added to the top of your library.

 **Open a Virtual Machine**
Open an existing virtual machine, which will then be added to the top of your library.

 **Upgrade to VMware Workstation Pro**
Get advanced features such as snapshots, virtual network management, and more.

 **Help**
View online help.

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The presentation launches VMware Player. The presentation selects "Create a New Virtual Machine".



New Virtual Machine Wizard

Welcome to the New Virtual Machine Wizard
A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

Installer disc:
No drives available

Installer disc image file (iso):
D:\msdnaa\pfsense\pfSense-CE-2.6.0-RELEASE-amd64.iso [Browse...]

I will install the operating system later.
The virtual machine will be created with a blank hard disk.

[Help] [< Back] [Next >] [Cancel]

The presentation selects "I will install the operating system later" . The presentation selects "next".

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Home

New Virtual Machine Wizard

Select a Guest Operating System
Which operating system will be installed on this virtual machine?


Guest operating system

- Microsoft Windows
- Linux
- Other

Version

FreeBSD 12 64-bit

Help < Back Next > Cancel

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The presentation is installing pfsense 2.6.0.
The selections shown are correct.
The presentation selects "next".

Home


New Virtual Machine Wizard

Name the Virtual Machine
What name would you like to use for this virtual machine?

Virtual machine name:

Location:

< Back Next > Cancel

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The presentation provides the VMware Player name for the virtual machine. The presentation provides the path for the virtual machine location.

The presentation selects "next".

Home

New Virtual Machine Wizard

Specify Disk Capacity

How large do you want this disk to be?

The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.


Maximum disk size (GB):

Recommended size for FreeBSD 12 64-bit: 20 GB

Store virtual disk as a single file
 Split virtual disk into multiple files

Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

Help < Back Next > Cancel

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The presentation sets the disk size as shown.

The presentation prefers the disk as a single file, but that is a preference.

The presentation selects "next".

New Virtual Machine Wizard

Ready to Create Virtual Machine

Click Finish to create the virtual machine. Then you can install FreeBSD 12 64-bit.

The virtual machine will be created with the following settings:

Name:	341r
Location:	D:\Virtual_Machines\csis341\341r
Version:	Workstation 16.2.x
Operating System:	FreeBSD 12 64-bit
Hard Disk:	20 GB
Memory:	256 MB
Network Adapter:	NAT
Other Devices:	CD/DVD, USB Controller, Sound Card

Customize Hardware...

Cancel

The presentation selects "customize hardware" to continue.

... licensed and is authorized for non-...
... ly. For commercial use, purchase a license.

Player

Home

Device	Summary
Memory	256 MB
Processors	1
New CD/DVD (IDE)	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Add...

Remove

Memory

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine: 4096 MB

The presentation set the RAM as shown.
The presentation selects "Processors" to continue.

32 MB
16 MB
8 MB
4 MB

32 MB

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Processors

Number of processor cores: 2

Virtualization engine

- Virtualize Intel VT-x/EPT or AMD-V/RVI
- Virtualize CPU performance counters
- Virtualize IOMMU (IO memory management unit)

The presentation sets the number of processors as shown.

At the time of this writing, the presentation is unaware of the advantage of anything under "Virtualization engine".

The presentation selects "new cd/dvd" to continue.

Add...

Remove

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Connection

Use physical drive:

Auto detect

Use ISO image file:

D:\msdnaa\pfsense\pfsense-CE-2.6.0-RELEASE-am Browse...

Advanced...

The presentation sets "cd/dvd" as shown.
The path is to the installation "iso" file.

The presentation selects "network adapter"
to continue.

Add...

Remove

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Network connection

- Bridged: Connected directly to the physical network
 Replicate physical network connection state
- NAT: Used to share the host's IP address
 Host-only: A private network shared with the host
 Custom: Specific virtual network

VMnet0

- LAN segment:

Configure Adapters

LAN Segments...

Advanced...

Add...

Remove

The presentation sets the network adapter as shown.

At the bottom of the screen, the presentation selects "add" to continue.

Device	Summary	Device status
Memory	4 GB	<input type="checkbox"/> Connected
Processors	2	<input checked="" type="checkbox"/> Connect at power on
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...	
Network Adapter	NAT	
USB Controller		
Sound Card		
Display		

Add Hardware Wizard

Hardware Type

What type of hardware do you want to install?

Hardware types:	Explanation
<input type="radio"/> CD/DVD Drive	
<input type="radio"/> Floppy Drive	
<input checked="" type="radio"/> Network Adapter	Add a network adapter.
<input type="radio"/> USB Controller	
<input type="radio"/> Sound Card	
<input type="radio"/> Parallel Port	
<input type="radio"/> Serial Port	
<input type="radio"/> Printer	
<input type="radio"/> Generic SCSI Device	

Finish Cancel

Add... Remove

The presentation selects "network adapter" and "finish" to continue. This adds a second network adapter to the virtual machine.

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Network connection

- Bridged: Connected directly to the physical network
 Replicate physical network connection state
- NAT: Used to share the host's IP address
 Host-only: A private network shared with the host
 Custom: Specific virtual network

VMnet0

- LAN segment:

LAN Segments...

Advanced...

Add...

Remove

The presentation selects "network adapter 2". The presentation changes the connection to "LAN segment" as shown.

The presentation selects the "LAN Segment" button to continue.

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

Connected

Connected

Network

Bridged

NAT

Host-only

LAN Segments...

Advanced...

Add... Remove

Global LAN Segments

Global LAN Segments:

net01

Add Rename Remove

OK Cancel

The presentation selects "add" and creates an new LAN Segment named "net01".

The presentation selects "OK" to continue.

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Network connection

- Bridged: Connected directly to the physical network
 Replicate physical network connection state
- NAT: Used to share the host's IP address
 Host-only: A private network shared with the host
 Custom: Specific virtual network

VMnet0

 LAN segment:

net01

LAN Segments...

Advanced...

Add...

Remove

The presentation selects the box under LAN Segment and selects the network to connect.

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Network connection

- Bridged: Connected directly to the physical network
 Replicate physical network connection state
- NAT: Used to share the host's IP address
 Host-only: A private network shared with the host
 Custom: Specific virtual network

VMnet0

- LAN segment:

net01

LAN Segments...

Advanced...

The presentation selects "USB Controller" to continue.

Add...

Remove

Player

Home

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	LAN Segment
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Connections

USB compatibility: USB 2.0

- Show all USB input devices
 Share Bluetooth devices with the virtual machine

USB device type restrictions

Allow the following USB device types:

Add USB device type to enable independent setting of restrictions:

Add...

Remove

Add...

Remove

The presentation does not make any changes. The presentation selects "sound card" to continue.

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	LAN Segment
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
 Connect at power on

Connection

- Use default host sound card
 Specify host sound card:

Speakers (Synaptics Audio)

Echo cancellation

- Enable echo cancellation

The presentation makes no changes. The presentation selects "Display" to continue.

Add...

Remove

Device	Summary
Memory	4 GB
Processors	2
New CD/DVD (IDE)	Using file D:\msdnaa\pfsens...
Network Adapter	NAT
Network Adapter 2	LAN Segment
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

3D graphics

 Accelerate 3D graphics

Monitors

 Use host setting for monitors Specify monitor settings:

Number of monitors:

1

Maximum resolution of any one monitor:

2560 x 1600

The presentation makes no changes. The presentation selects "OK" at the bottom of the window to continue.

Add...

Remove

New Virtual Machine Wizard

Ready to Create Virtual Machine
Click Finish to create the virtual machine. Then you can install FreeBSD 12 64-bit.

The virtual machine will be created with the following settings:

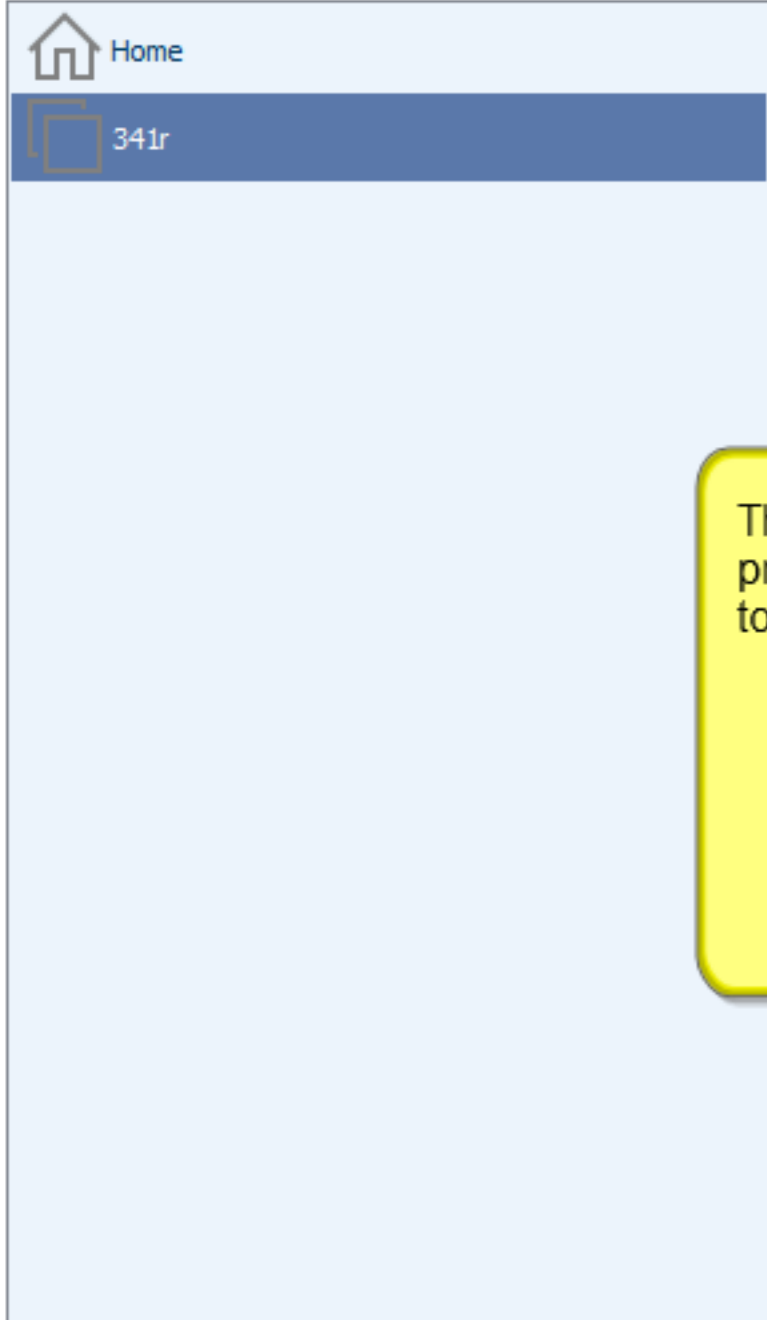
- Name: 341r
- Location: D:\Virtual_Machines\csis341\341r
- Version: Workstation 16.2.x
- Operating System: FreeBSD 12 64-bit

- Hard Disk: 20 GB
- Memory: 4096 MB
- Network Adapter: NAT, LAN Segment
- Other Devices: 2 CPU cores, CD/DVD, USB Controller, Sound Card



Customize Hardware...

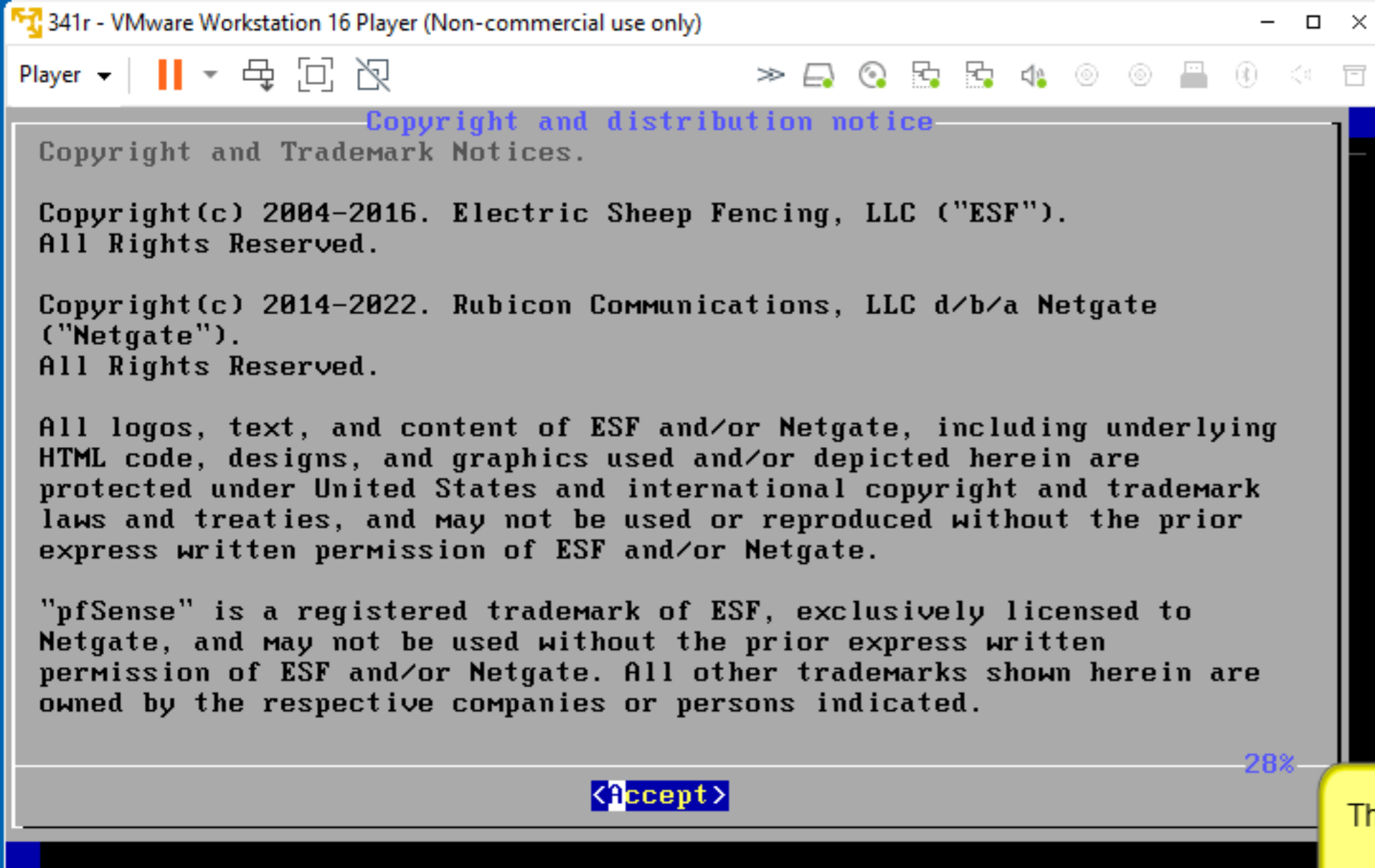
< Back Finish Cancel

The presentation selects "finish" to continue.



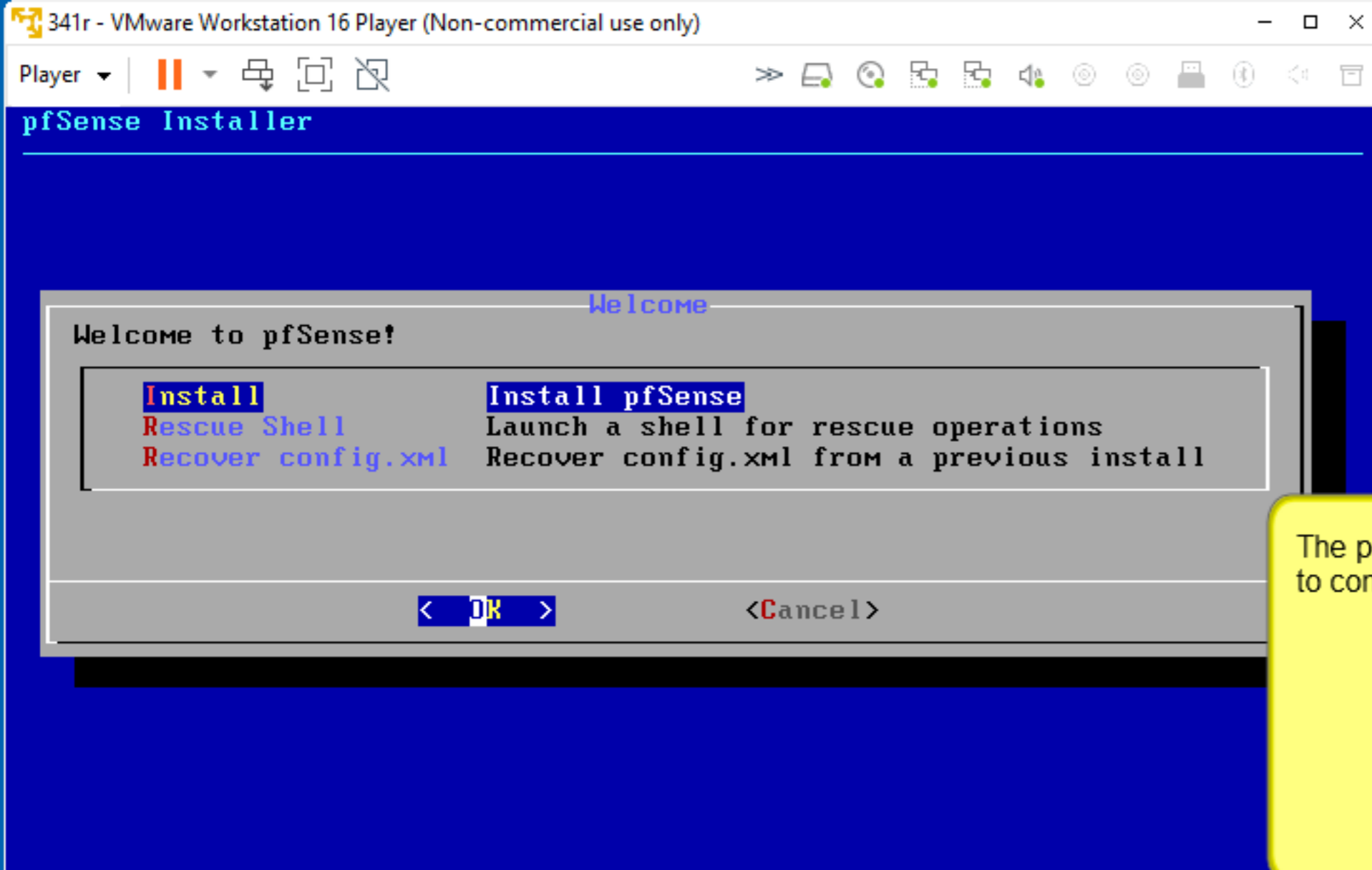
The virtual machine is ready. The presentation selects "play virtual machine" to continue.

- RAM: 4 GB**
-  Play virtual machine
-  Edit virtual machine settings



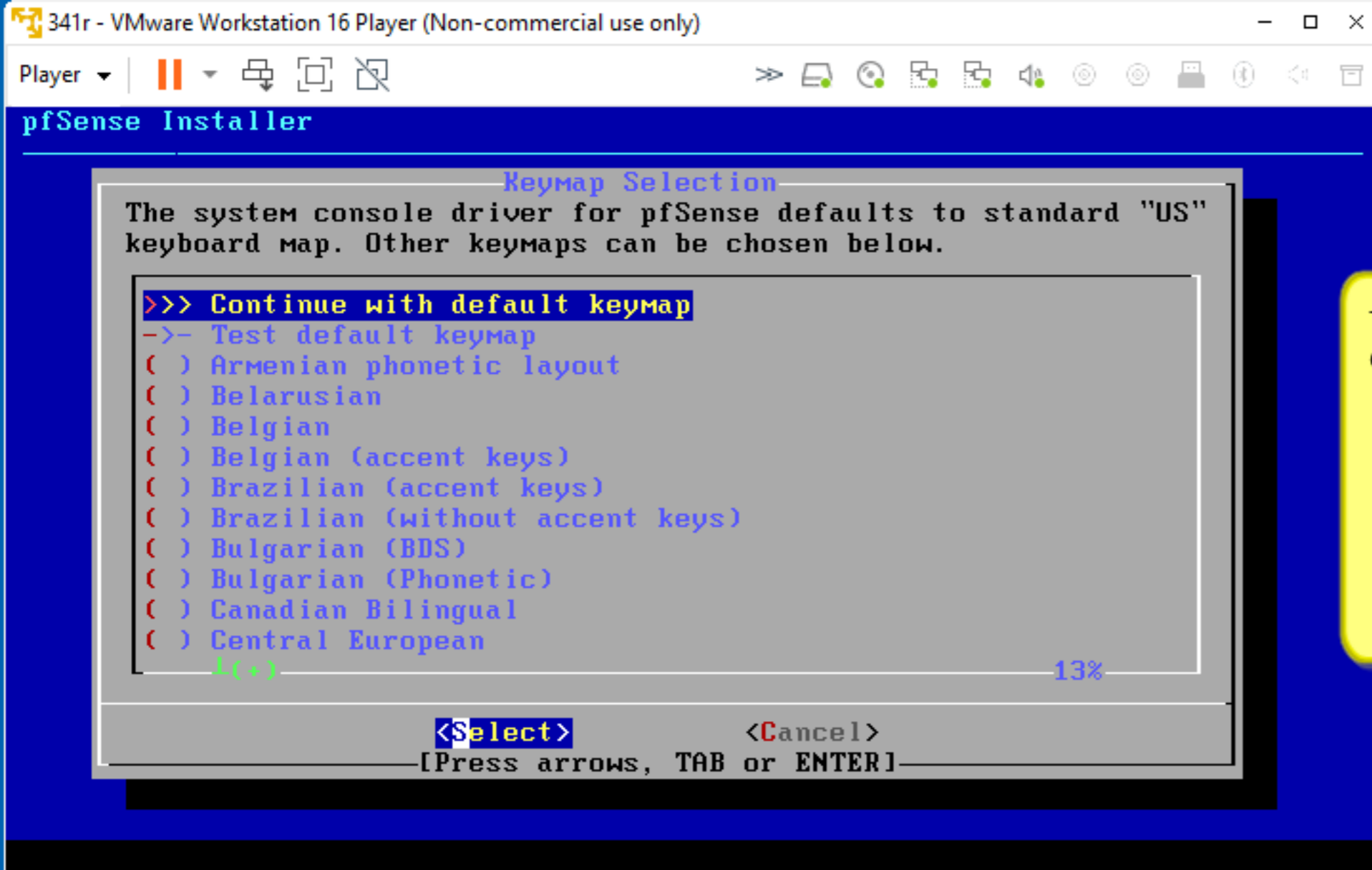
The presentation "accept" the license.

Note: pressing the left ctrl and alt key will release the mouse from the virtual machine.



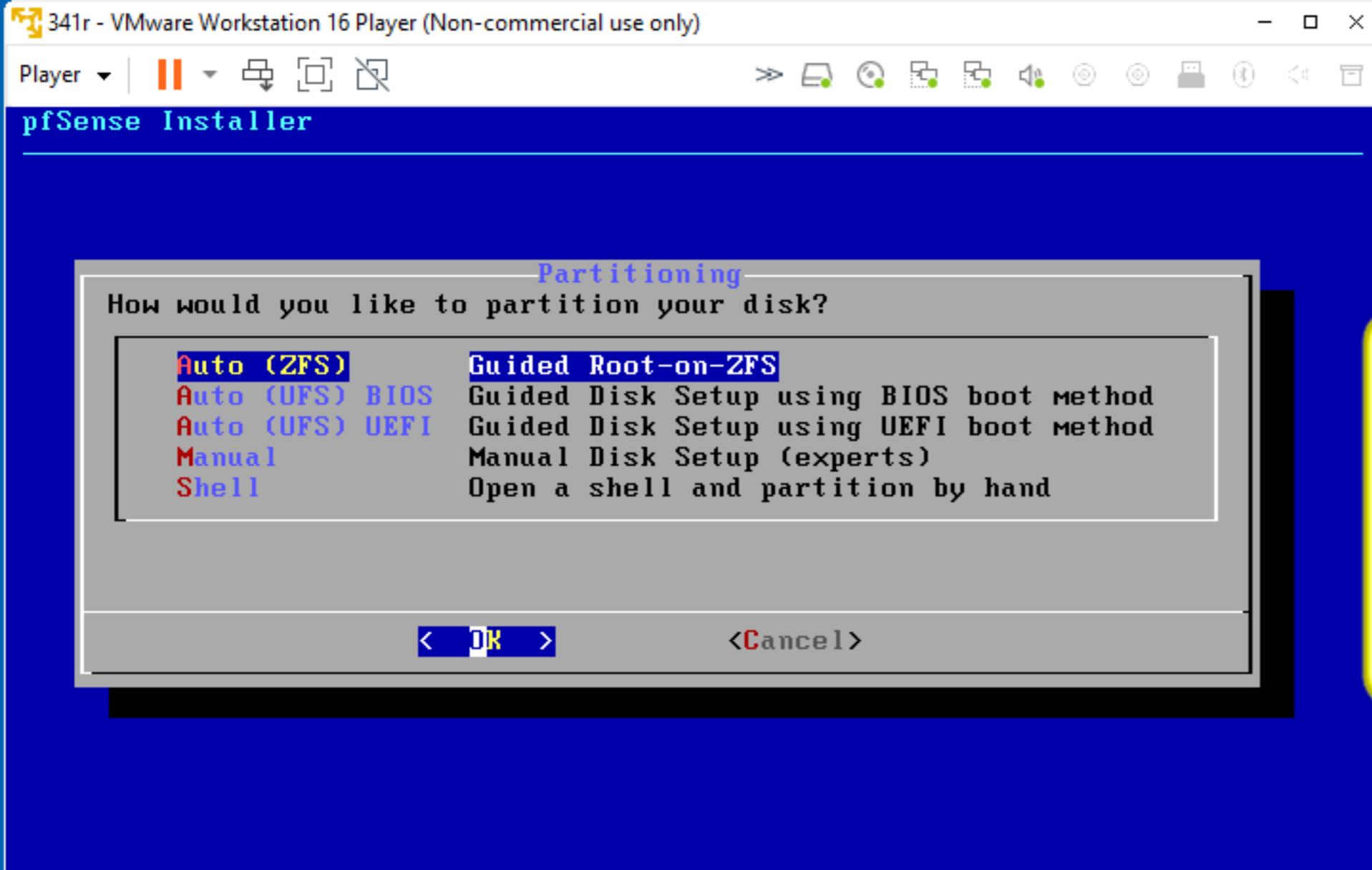
The presentation selects "Install" and "OK" to continue.

2

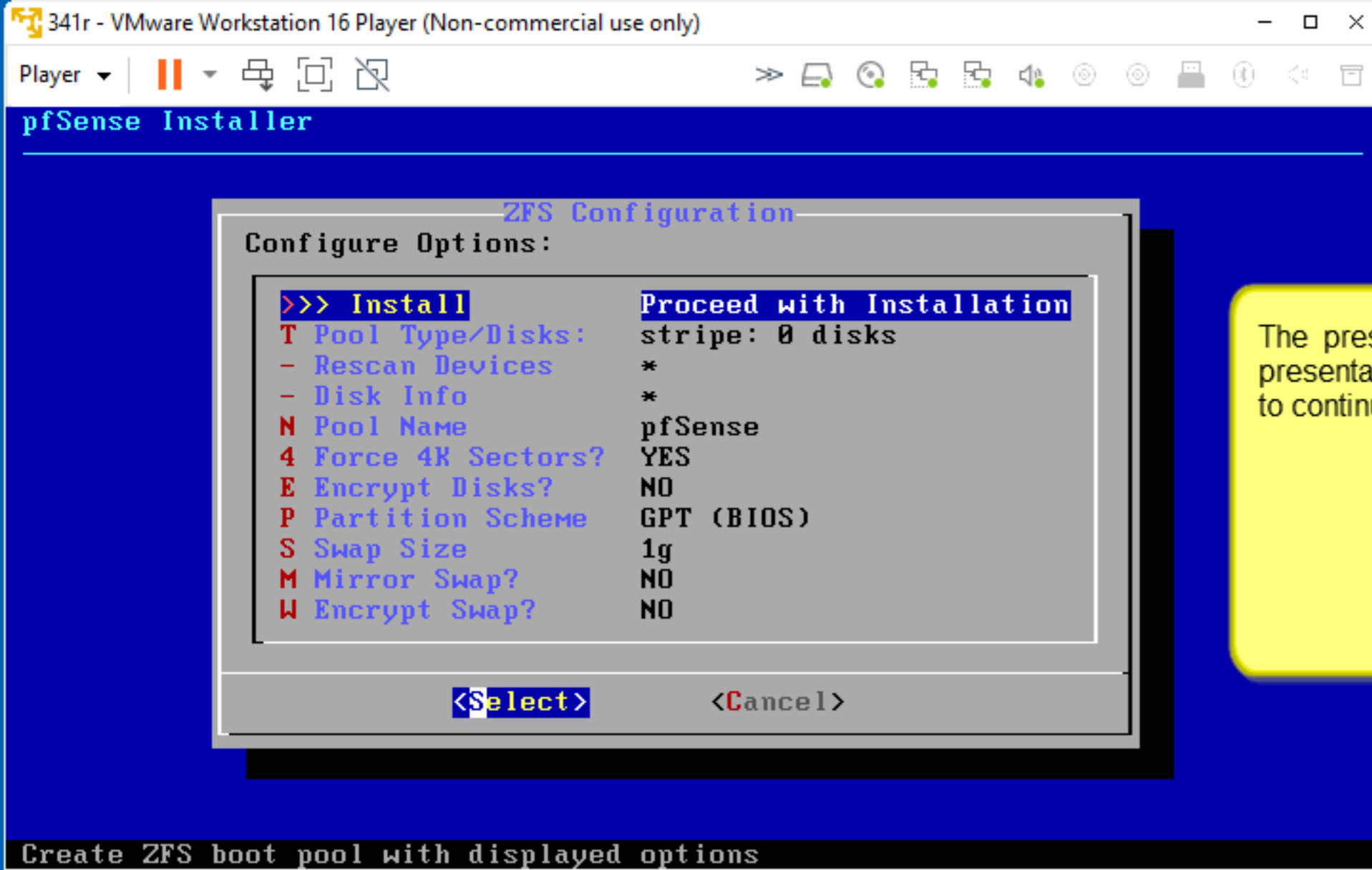


The presentation selects "continue with default keymap" and "select" to continue.

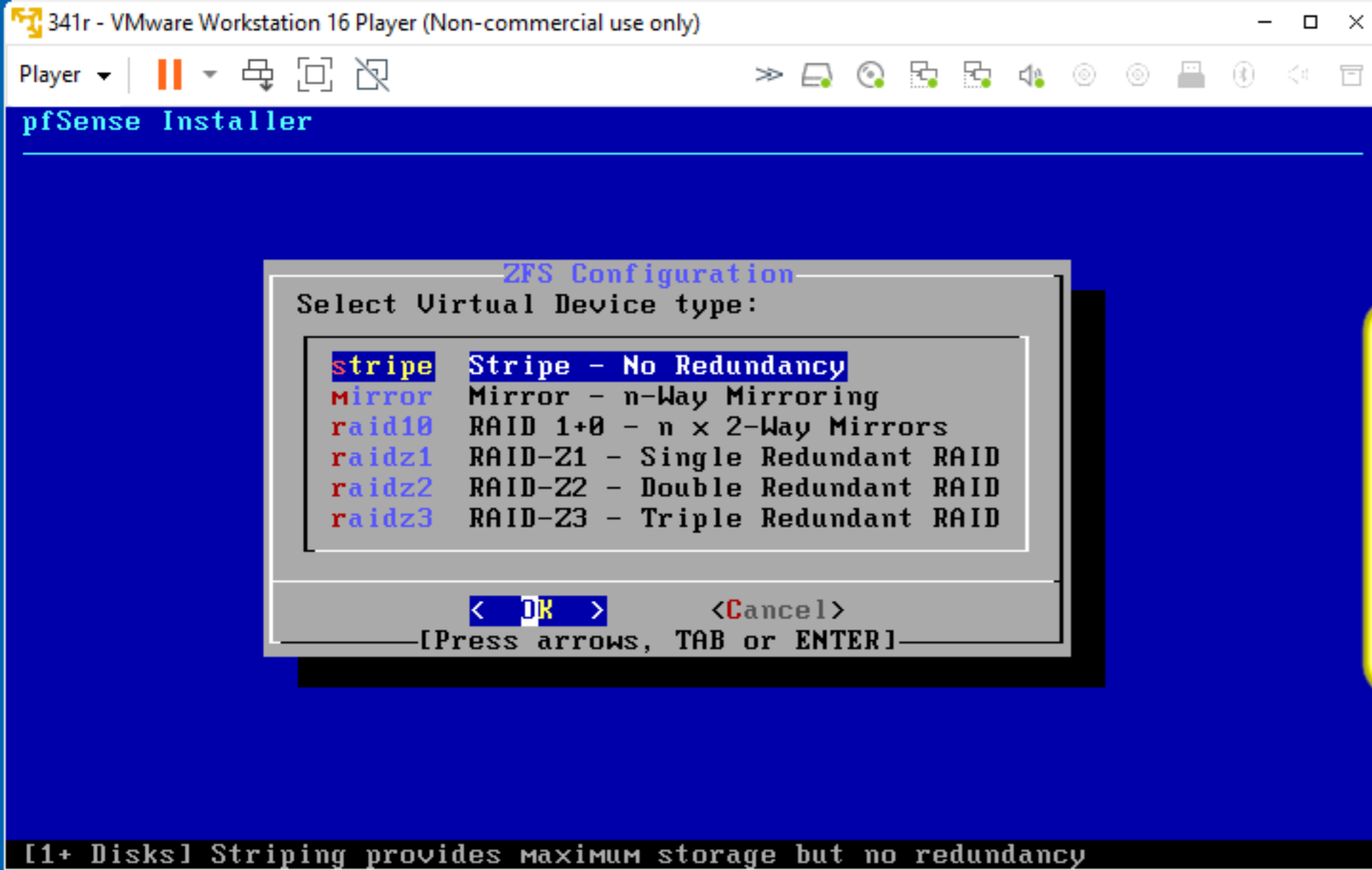




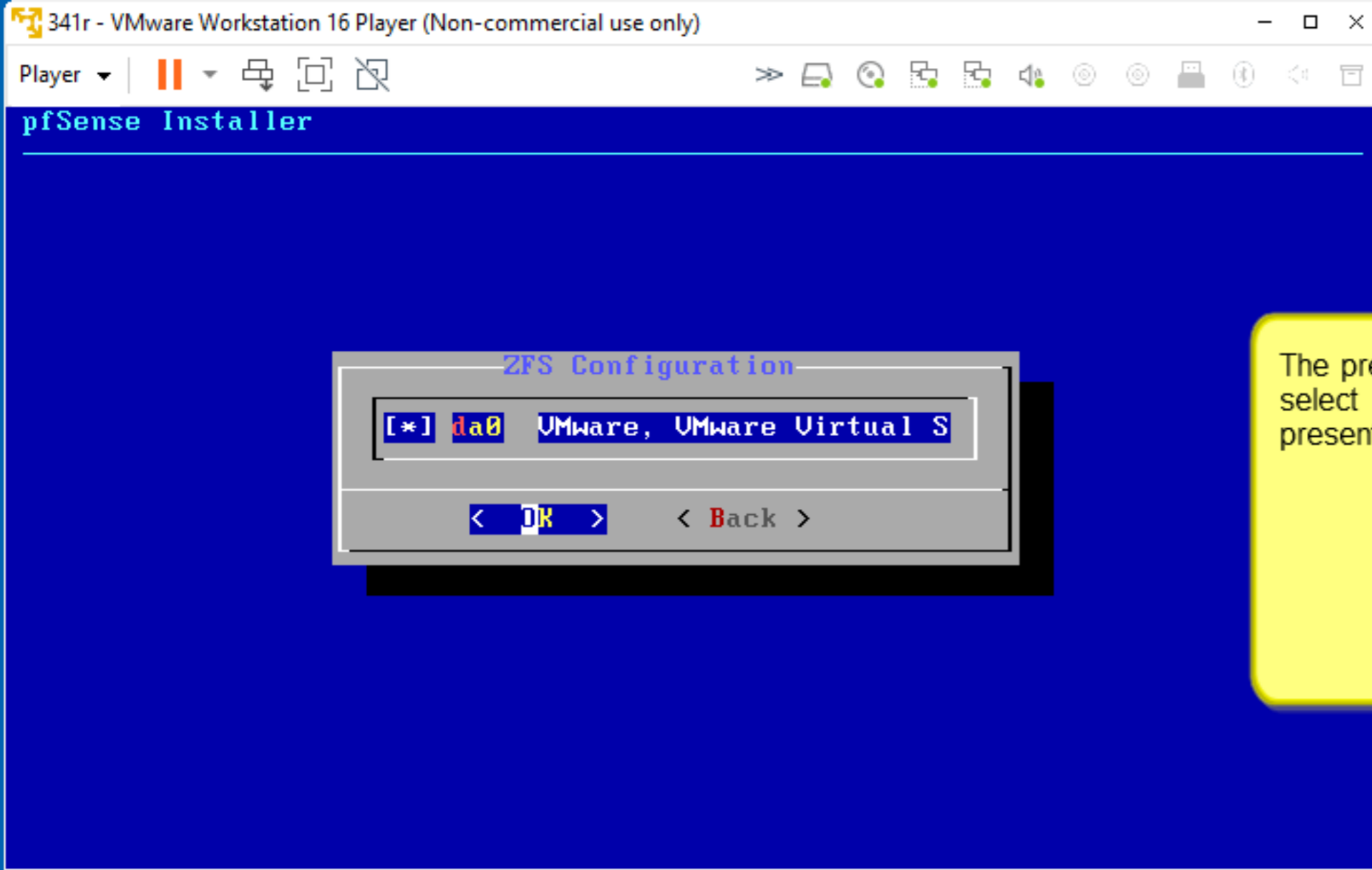
The presentation selects "Auto (ZFS)" and "OK" to continue.



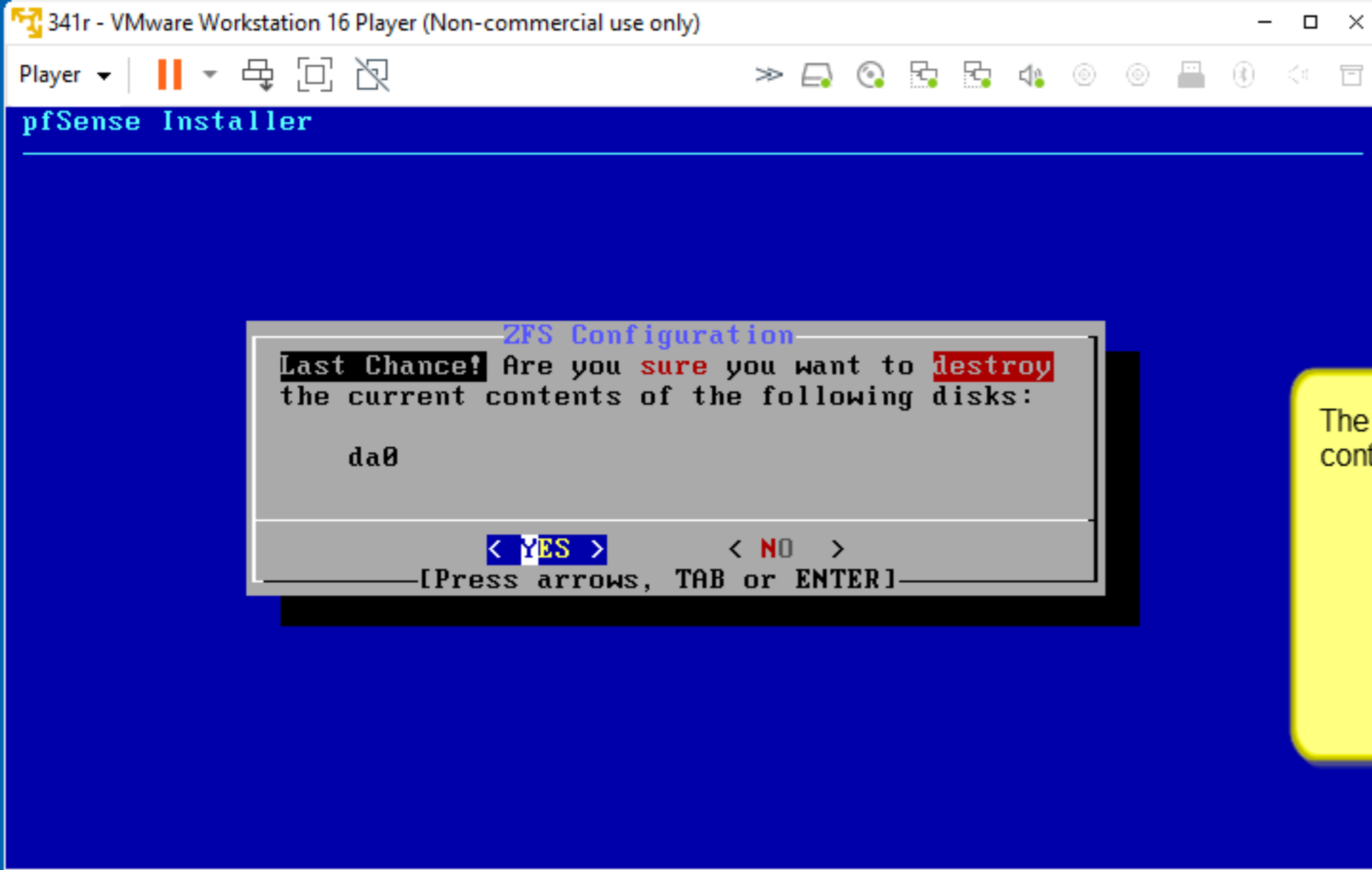
The presentation make no changes. The presentation selects "Install" and "Select" to continue.



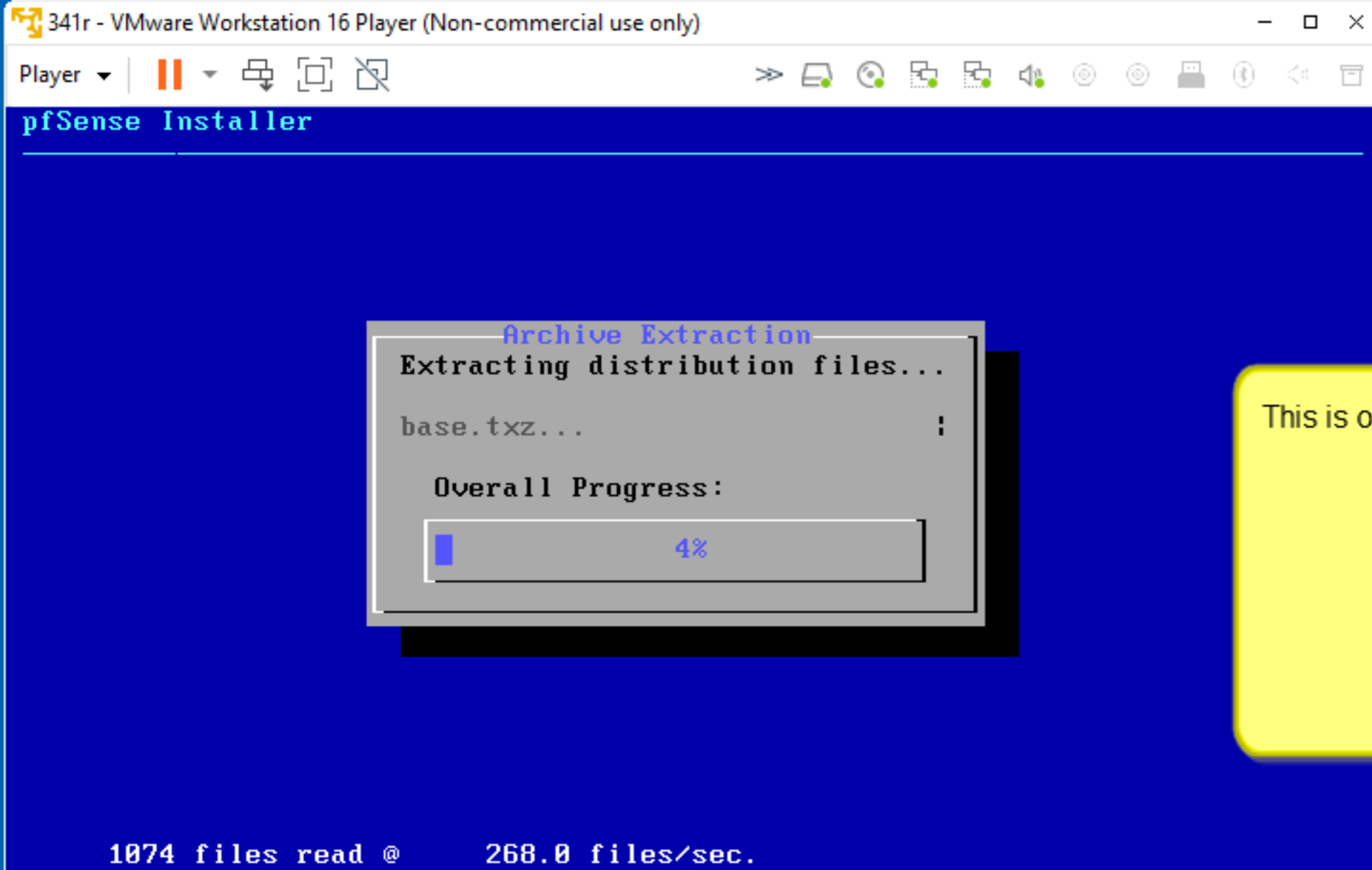
The presentation selects "stripe" and "OK" to continue.



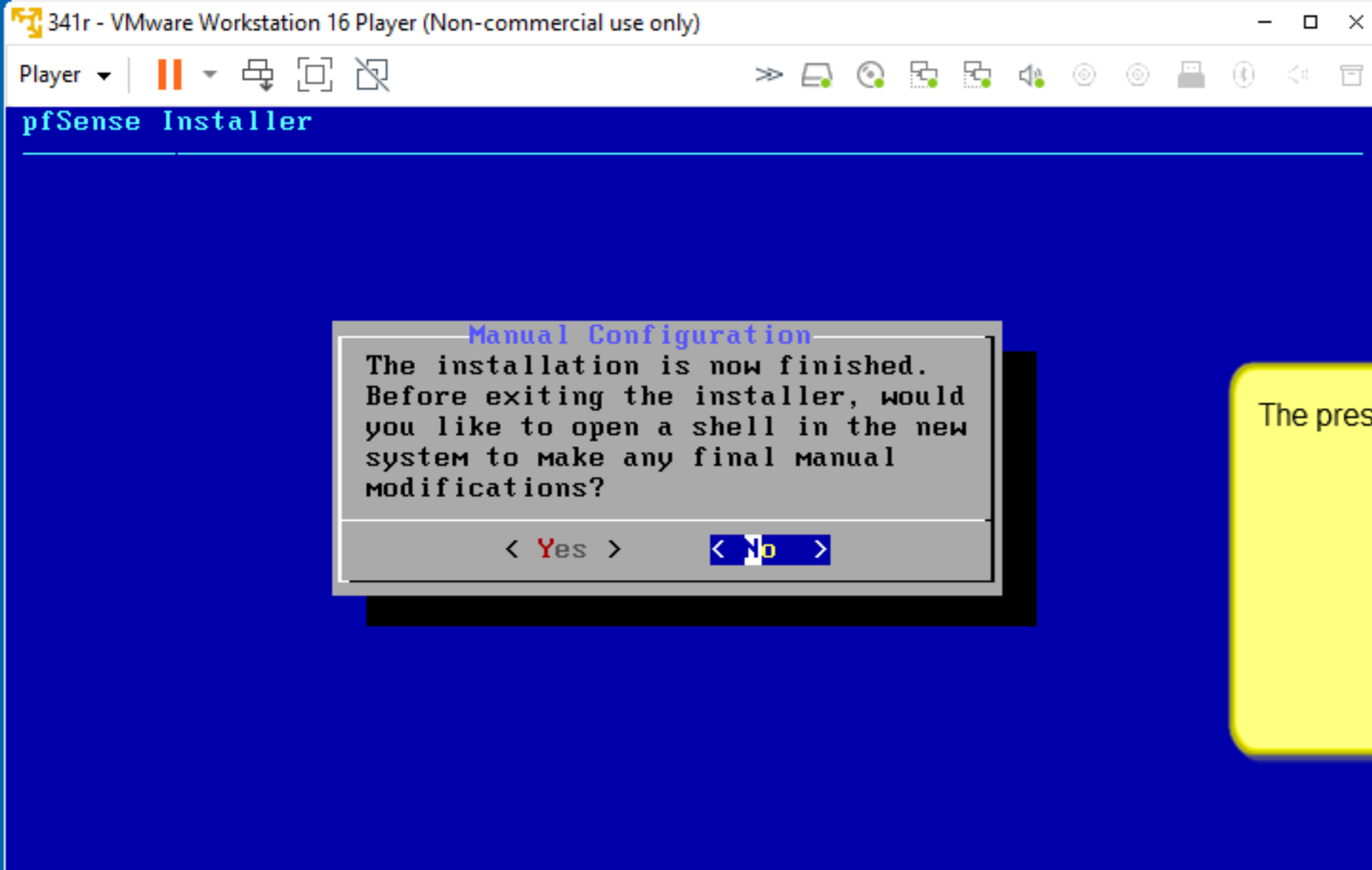
The presentation presses the spacebar to select drive "da0". After selection, the presentation selects "OK" to continue.



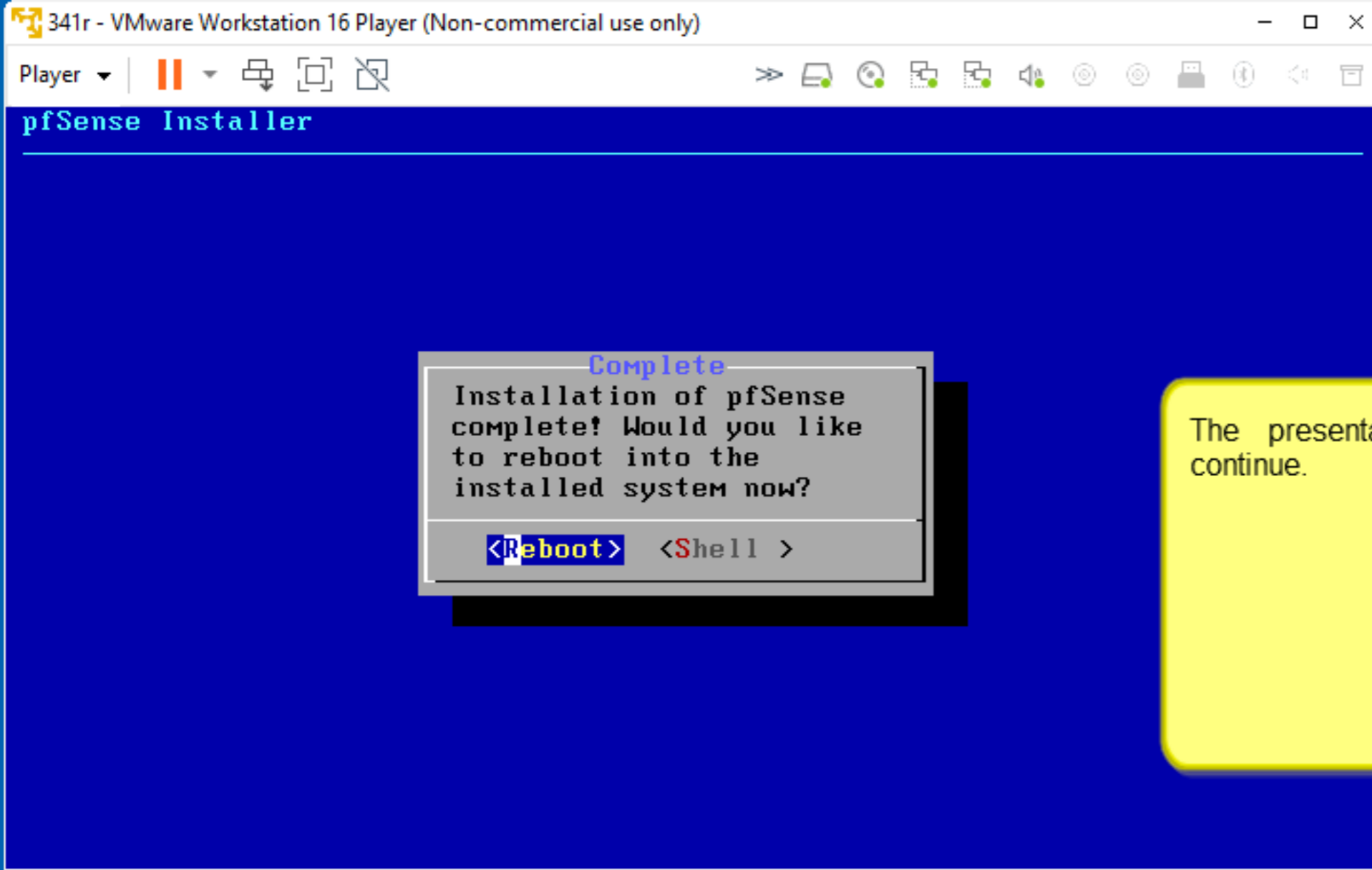
The presentation selects "YES" to continue.



This is one of many installation screens.



The presentation selects "No" to continue.



The presentation selects "Reboot" to continue.


```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
Starting syslog...done.
Starting CRON... done.
pfSense 2.6.0-RELEASE amd64 Mon Jan 31 19:57:53 UTC 2022
Bootup complete

FreeBSD/amd64 (pfSense.home.arp) (ttyv0)
VMware Virtual Machine - Netgate Device ID: 16ee4d2609cfaa2e1b55

*** Welcome to pfSense 2.6.0-RELEASE (amd64) on pfSense ***

WAN (wan)      -> em0      -> v4/DHCP4: 192.168.117.141/24
LAN (lan)     -> em1      -> v4: 192.168.1.1/24

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces         10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults  13) Update from console
5) Reboot system             14) Enable Secure Shell (sshd)
6) Halt system               15) Restore recent configuration
7) Ping host                 16) Restart PHP-FPM
8) Shell

Enter an option: █
```

Rebooting finishes at this screen.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
VMware Virtual Machine - Netgate Device ID: 16ee4d2609cfaa2e1b55
*** Welcome to pfSense 2.6.0-RELEASE (amd64) on pfSense ***
WAN (wan)      -> em0      -> v4/DHCP4: 192.168.117.141/24
LAN (lan)      -> em1      -> v4: 192.168.1.1/24

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces          10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults    13) Update from console
5) Reboot system              14) Enable Secure Shell (sshd)
6) Halt system                15) Restore recent configuration
7) Ping host                  16) Restart PHP-FPM
8) Shell

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: █
```

The presentation selects option "2" to change the IP address. The presentation selects "2" to change the LAN IP address.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
WAN (wan)      -> em0      -> v4/DHCP4: 192.168.117.141/24
LAN (lan)      -> em1      -> v4: 192.168.1.1/24

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces          10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults    13) Update from console
5) Reboot system              14) Enable Secure Shell (sshd)
6) Halt system                15) Restore recent configuration
7) Ping host                  16) Restart PHP-FPM
8) Shell

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24
```

The presentation enters the desired IP address for the interface with subnet mask. The presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
0) Logout (SSH only)          9) pfTop
1) Assign Interfaces         10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults 13) Update from console
5) Reboot system            14) Enable Secure Shell (sshd)
6) Halt system              15) Restore recent configuration
7) Ping host                16) Restart PHP-FPM
8) Shell

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
> 
```

The interface does not have an upstream gateway. The presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
3) Reset webConfigurator password    12) PHP shell + pfSense tools
4) Reset to factory defaults         13) Update from console
5) Reboot system                     14) Enable Secure Shell (sshd)
6) Halt system                       15) Restore recent configuration
7) Ping host                         16) Restart PHP-FPM
8) Shell

Enter an option: 2

Available interfaces:
1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address. Press <ENTER> for none:
> FECC::10:1/64
```

The presentation enters the IPv6 address and subnet mask for the interface. The presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
7) Ping host
8) Shell
16) Restart PHP-FPM

Enter an option: 2

Available interfaces:
1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address. Press <ENTER> for none:
> FECC::10:1/64

For a WAN, enter the new LAN IPv6 upstream gateway address.
For a LAN, press <ENTER> for none:
> |
```

The interface does not have an upstream IPv6 gateway. The presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
Enter an option: 2
Available interfaces:
1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
Enter the number of the interface you wish to configure: 2
Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24
For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>
Enter the new LAN IPv6 address. Press <ENTER> for none:
> FECC::10:1/64
For a WAN, enter the new LAN IPv6 upstream gateway address.
For a LAN, press <ENTER> for none:
>
Do you want to enable the DHCP server on LAN? (y/n) |
```

The presentation enter "n" for DHCP server. The presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
Available interfaces:
1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address. Press <ENTER> for none:
> FECC::10:1/64

For a WAN, enter the new LAN IPv6 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Do you want to enable the DHCP server on LAN? (y/n) n
Disabling IPv4 DHCPD...

Do you want to enable the DHCP6 server on LAN? (y/n) |
```

The presentation enter "n" for DHCPv6 server. The presentation presses "enter" to continue.


```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
2 - LAN (em1 - static)
Enter the number of the interface you wish to configure: 2
Enter the new LAN IPv4 address. Press <ENTER> for none:
> 192.168.10.1/24
For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>
Enter the new LAN IPv6 address. Press <ENTER> for none:
> FECC::10:1/64
For a WAN, enter the new LAN IPv6 upstream gateway address.
For a LAN, press <ENTER> for none:
>
Do you want to enable the DHCP server on LAN? (y/n) n
Disabling IPv4 DHCPD...
Do you want to enable the DHCP6 server on LAN? (y/n) n
Disabling IPv6 DHCPD...
Do you want to revert to HTTP as the webConfigurator protocol? (y/n) █
```

The presentation enters "n" and presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
>
Do you want to enable the DHCP server on LAN? (y/n) n
Disabling IPv4 DHCPD...

Do you want to enable the DHCP6 server on LAN? (y/n) n
Disabling IPv6 DHCPD...

Do you want to revert to HTTP as the webConfigurator protocol? (y/n) n

Please wait while the changes are saved to LAN...
Reloading filter...
Reloading routing configuration...
DHCPD...

The IPv4 LAN address has been set to 192.168.10.1/24

The IPv6 LAN address has been set to FECC::10:1/64
You can now access the webConfigurator by opening the following URL in your web
browser:
    https://192.168.10.1/
    https://[FECC::10:1]/

Press <ENTER> to continue. █
```

After noting the web addresses, the presentation presses "enter" to continue.

```
341r - VMware Workstation 16 Player (Non-commercial use only)
Player | [Icons]
You can now access the webConfigurator by opening the following URL in your web browser:
    https://192.168.10.1/
    https://[FECC::10:1]/
Press <ENTER> to continue.
VMware Virtual Machine - Netgate Device ID: 16ee4d2609cfaa2e1b55
*** Welcome to pfSense 2.6.0-RELEASE (amd64) on pfSense ***
WAN (wan)      -> em0      -> v4/DHCP4: 192.168.117.141/24
LAN (lan)      -> em1      -> v4: 192.168.10.1/24
                v6: FECC::10:1/64

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces         10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults  13) Update from console
5) Reboot system             14) Enable Secure Shell (sshd)
6) Halt system               15) Restore recent configuration
7) Ping host                 16) Restart PHP-FPM
8) Shell

Enter an option: █
```

The router is ready for web configuration.

Virtual Machine Settings



Hardware Options

Device	Summary
Memory	4 GB
Processors	2
Hard Disk (SCSI)	40 GB
CD/DVD (IDE)	Using file D:\msdnaa\debian\...
Network Adapter	LAN Segment
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Device status

- Connected
- Connect at power on

Network connection

- Bridged: Connected directly to the physical network
 - Replicate physical network connection state
- NAT: Used to share the host's IP address
- Host-only: A private network shared with the host
- Custom: Specific virtual network

[Configure Adapters](#)

VMnet0 ▾

 LAN segment:

net01 ▾

[LAN Segments...](#)[Advanced...](#)

The presentation starts a virtual machine with a web browser that is connected to the "LAN Segment" called "net01" in this presentation.

```
t qlen 1000
```

```
roup default qlen 1000
```

```
N group default
```

```
tate DOWN group default
```

```
preuss@csis341-debian: ~  
preuss@csis341-debian:~$ cat /etc/debian_version  
11.5  
preuss@csis341-debian:~$ ip a sh  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 00:0c:29:ea:49:cb brd ff:ff:ff:ff:ff:ff  
    altname enp2s1  
    inet 192.168.10.10/24 brd 192.168.10.255 scope global noprefixroute ens33  
        valid_lft forever preferred_lft forever  
    inet6 fecc::10:10/64 scope site noprefixroute  
        valid_lft forever preferred_lft forever  
    inet6 fe80::20c:29ff:feea:49cb/64 scope link noprefixroute  
        valid_lft forever preferred_lft forever  
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default  
    link/ether 02:42:8c:8f:de:8b brd ff:ff:ff:ff:ff:ff  
    inet 172.17.0.1/16 brd 172.17.255.255 scope global noprefixroute docker0  
        valid_lft forever preferred_lft forever  
4: br-b9c17ea3c03b: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default  
    link/ether 02:42:f0:24:6b:85 brd ff:ff:ff:ff:ff:ff  
    inet 192.168.49.1/24 brd 192.168.49.255 scope global noprefixroute br-b9c17ea3c03b  
        valid_lft forever preferred_lft forever  
preuss@csis341-debian:~$ █
```

The presentation shows the Debian version and current IP addresses. These addresses are static addresses set earlier.

The presentation is showing the router virtual machine and the Debian virtual machine must be running at the same time.

```
ation 16 Player (Non-commercial use only)
Access the webConfigurator by opening the following URL in your web browser:
https://192.168.10.1/
https://[FECC::10:1]/
Press the space key to continue.
VMware Virtual Machine - Netgate Device ID: 16ee4d2609cfaa2e1b55
*** Welcome to pfSense 2.6.0-RELEASE (amd64) on pfSense ***

WAN (wan)      -> em0      -> v4/DHCP4: 192.168.117.141/24
LAN (lan)      -> em1      -> v4: 192.168.10.1/24
               v6: FECC::10:1/64

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces         10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults  13) Update from console
5) Reboot system             14) Enable Secure Shell (sshd)
6) Halt system               15) Restore recent configuration
7) Ping host                 16) Restart PHP-FPM
8) Shell

Enter an option: |
```

Warning: Potential Security Risk Ahead

Not Secure https://[fecc::10:1]

The presentation enters the router IPv6 address as shown.
Yes, in this case the IPv4 address would work very nicely.

Warning: Potential Security Risk Ahead

Firefox detected a potential security threat and did not continue to [fecc::10:1]. If you visit this site, you may be asked for information like your passwords, emails, or credit card details.

[Learn more...](#)

Go Back (Recommended)

[fecc::10:1] uses an invalid security certificate.
The certificate is not trusted because it is self-signed.

Warning: Potential Security Risk Ahead



Not Secure https://[fecc::10:1]



Warning: Potential Security Risk Ahead

Firefox detected a potential security threat and did not continue to [fecc::10:1]. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.

The presentation selects "Advance" to continue.

[Go Back \(Recommended\)](#)[Advanced...](#)

Warning: Potential Security Risk Ahead



Not Secure https://[fecc::10:1]



Warning: Potential Security Risk Ahead

Firefox detected a potential security threat and did not continue to [fecc::10:1]. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.

[Learn more...](#)

The presentation selects "accept the risk and continue".

Go B

[fecc::10:1] uses an invalid security certificate.

The certificate is not trusted because it is self-signed.

Error code: [MOZILLA_PKIX_ERROR_SELF_SIGNED_CERT](#)


[View Certificate](#)

Go Back (Recommended)

Accept the Risk and Continue

pfSense - Login

https://[fecc::10:1]



Login to pfSense

The presentation enters the default login "admin" and the current default password "pfsense". The presentation selects "sign in" to continue.

SIGN IN





admin



password

SIGN IN


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pfSense.home.arpa - Wiz: x

← → ↻  [https://\[fecc::10:1\]/wizard.php?xml=setup_wizard.xml](https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml)   

 **System ▾** **Interfaces ▾** **Firewall ▾** **Services ▾** **VPN ▾** **Status ▾** **Diagnostics ▾** **Help ▾** 

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / [pfSense Setup](#) / 

Step

pfSense Setup

Welcome to pfSense® software!

This wizard will provide guidance th

The wizard may be stopped at any t

pfSense® software is developed an

[Learn more](#)


[» Next](#)

The presentation reads the screen and selects "next" to continue.

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pfSense.home.arpa - Wiz: x

https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml

 pfSense
COMMUNITY EDITION

System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / [pfSense Setup](#) / [Netgate® Global Support is available 24/7](#) 

Step 1 of 9

Netgate® Global Support is available 24/7

Our 24/7 worldwide team of support engineers are the most qualified to diagnose your issue and resolve it quickly, from branch office to enterprise — on premises to cloud.

We offer several support subscription plans tailored to fit different environment sizes and requirements. Many companies around the world choose Netgate support because:

- Support is available 24 hours a day, 7 days a week.
- Support engineers are located in multiple time zones.
- Our support engineers have extensive experience with networking.

[Learn more](#)

[» Next](#)

The presentation reads the screen and selects "next" to continue.

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pfSense.home.arp - Wiz: x

https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml

Wizard / pfSense Setup / General Information

Step 2 of 9

General Information

On this screen the general pfSense parameters will be set.

Hostname
EXAMPLE: myserver

Domain
EXAMPLE: mydomain.com

The default behavior of the DNS Resolver will ignore manually configured DNS servers. For more information on manually configured DNS servers below for client queries, visit Services > DNS Resolver.

Primary DNS Server

Secondary DNS Server

Override DNS
Allow DNS servers to be overridden by DHCP/PPP on WAN

>> Next

The presentation changes the internal name of the router as shown (341r).
The presentation changes the domain name as shown (example.org).
The presentation set the primary DNS and secondary DNS as shown.
The presentation selects "next" to continue.

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pfSense.home.arpa - Wiz: x

https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml

pfSense COMMUNITY EDITION | System ▾ | Interfaces ▾ | Firewall ▾ | Services ▾ | VPN ▾ | Status ▾ | Diagnostics ▾ | Help ▾

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / [pfSense Setup](#) / [Time Server Information](#) ?

Step 3 of 9

Time Server Information

Please enter the time, date and time zone.

Time server hostname

Enter the hostname (FQDN) of the time server.

Timezone

>> Next

The presentation sets the timezone as shown.
The presentation selects "next" to continue.

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pfSense.home.arp - Wiz: x +

pfSense
COMMUNITY EDITION
System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / [pfSense Setup](#) / [Configure WAN Interface](#)

Step 4 of 9

Configure WAN Interface

On this screen the Wide Area Network information will be configured.

SelectedType

General configuration

MAC Address

This field can be used to modify ("spoof") the MAC address of the WAN interface (may be used for NAT or other purposes) in the following format: xx:xx:xx:xx:xx:xx or leave blank.

MTU

Set the MTU of the WAN interface. If this field is left blank, an MTU of 1492 bytes for PPPoE and 1500 bytes for all other connection types will be assumed.







MSS

If a value is entered in this field, then MSS clamping for TCP connections to the value entered above minus 40 (TCP/IP header size) will be in effect. If this field is left blank, an MSS of 1492 bytes for PPPoE and 1500 bytes for all other connection types will be assumed. This should match the above MTU value in most all cases.

Static IP Configuration

The presentation makes changes at the bottom of this screen.

pfSense.home.arpa - Wiz: x

← → ↻   https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml    

PPTP Local IP Address

pptplocalsubnet 32 ▾

PPTP Remote IP Address

PPTP Dial on demand Enable Dial-On-Demand mode
This option causes the interface to operate in dial-on-demand mode, allowing a virtual full time connection. The interface is configured, but the actual connection of the link is delayed until qualifying outgoing traffic is detected.

PPTP Idle timeout
If no qualifying outgoing packets are transmitted for the specified number of seconds, the connection is brought down. An idle timeout of zero disables this feature.

RFC1918 Networks

Block RFC1918 Private Networks Block private networks from entering via WAN
When set, this option blocks traffic from IP addresses that are reserved for private use (10/8, 172.16/12, and 192.168/16) and loopback addresses (127/8). This option should generally be left unchecked.



Block bogon networks

Block bogon networks Block non-Internet routed networks from entering via WAN
When set, this option blocks traffic from IP addresses that are reserved for private use (10/8, 172.16/12, and 192.168/16) and loopback addresses (127/8). This option should never appear in the Internet routing table, and obviously should be left unchecked.





>> Next



The presentation unchecks "Block private networks" and "Block non-Internet routed" as shown.

The presentation selects "next to continue."


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pfSense.home.arpa - Wiz: x

 [https://\[fecc::10:1\]/wizard.php?xml=setup_wizard.xml](https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml)   

 System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾ 

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / [pfSense Setup](#) / [Configure LAN Interface](#) 

Step 5 of 9

Configure LAN Interface

On this screen the Local Area Network information will be configured.

LAN IP Address

Type dhcp if this interface uses DHCP to obtain its IP address.

Subnet Mask

>> Next

The presentation does not make any changes. The presentation selects "next" to continue.

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pfSense.home.arpa - Wiz: x

https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml

pfSense COMMUNITY EDITION System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾

WARNING: The 'admin' account password is set to the default value. [Change the password in the User Manager.](#)

Wizard / pfSense Setup / Set Admin WebGUI Password ?

Step 6 of 9

Set Admin WebGUI Password

On this screen the admin password will be set, which is used to access the WebGUI and also SSH services if enabled.

Admin Password

Admin Password AGAIN

>> Next

The presentation changes the "admin" password. The presentation selects "next" to continue.

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Wizard / pfSense Setup / Reload configuration 



Reload configuration


Click 'Reload' to reload pfSense with new changes.




The presentation selects "reload" to continue.

341r.example.org - Wizard ×

https://[fecc::10:1]/wizard.php?xml=setup_wizard.xml&stepid=9

 pfSense
COMMUNITY EDITION

System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾

Wizard / pfSense Setup / Wizard completed. 

Step 9 of 9

Wizard completed.

Congratulations! pfSense is now configured.

We recommend that you check to see if there are any software updates available. Keeping your software up to date is one of the most important things you can do to maintain the security of your network.

[Check for updates](#)

Remember, we're here

[Click here](#) to learn about Netgate

User survey

Please help all the people involved in this short survey (all answers are anonymous)

[Anonymous User Survey](#)






Useful resources.



- Learn more about Netgate's product line, services, and pfSense software from our [website](#)
- To learn about Netgate appliances and other offers, [visit our store](#)
- Become part of the pfSense community. Visit our [forum](#)
- Subscribe to our [newsletter](#) for ongoing product information, software announcements and special offers.


The presentation selects "check for updates".

r this short survey (all answers are

341r.example.org - System × +

← → ↻   https://[fecc::10:1]/pkg_mgr_install.php?id=firmware   

 COMMUNITY EDITION System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾ 

System / Update / System Update 

System Update Update Settings

Confirmation Required to update pfSense system.

Branch	<input type="text" value="Latest stable version (2.6.0)"/>
Please select the branch from which to update the system firmware. Use of the development version is at your own risk!	
Current Base System	2.6.0
Latest Base System	2.6.0
Status	Up to date.

It took some time, but the system is reporting "up to date".

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The screenshot shows the pfSense web interface in a browser window. The browser's address bar displays the URL `https://[fecc::10:1]/pkg_mgr_installed.php`. The page header includes the pfSense logo and a navigation menu with items: System, Interfaces, Firewall, Services, VPN, Status, Diagnostics, and Help. The 'System' menu is expanded, showing a list of options: Advanced, Cert. Manager, General Setup, High Avail. Sync, Logout (admin), Package Manager, Register, Routing, Setup Wizard, Update, and User Manager. The 'Package Manager' option is highlighted with a yellow background, and a yellow arrow points to it from a yellow text box. The text box contains the text: "Under the System menu, the presentation selects 'Package Manager'". The main content area of the page shows a breadcrumb trail: "System / Interfaces / Installed Packages". Below this, there is a section titled "Installed Packages" with a message that says "There are no packages installed". At the bottom of the page, a footer reads: "pfSense is developed and maintained by Netgate. © ESF 2004 - 2022 View license."

341r.example.org - System x

https://[fecc::10:1]/pkg_mgr.php

pfsense
COMMUNITY EDITION

System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾

System / Package Manager / Available Packages ?

Installed Packages Available Packages

The presentation selects "Available Packages".

Search

Search term






Enter a search string or * for wildcards



Search **Clear**

Packages

Name	Version	Description	
acme	0.7.1_1	Automated Certificate Management Utilities (ACME) client. It can generate certificates. Package Dependencies: pecl-ssh2-1.3.1 socat-1.7.4.2 php74-7.4.26 php74-ftp-7.4.26	+ Install
apcupsd	0.3.91_10	"apcupsd" can be used for controlling all APC UPS models. It can monitor and log the current power and battery status, perform automatic shutdown, and can run in network mode in order to power down other hosts on a LAN. Package Dependencies: apcupsd-3.14.14_4	+ Install
arping	1.2.2_2	Broadcasts a who-has ARP packet on the network and prints answers. Package Dependencies: arping-2.21	+ Install
arpwatch	0.2.0_6	This package contains tools that monitors ethernet activity and maintains a database of ethernet/ip address pairings. It also	+ Install

341r.example.org - System ▾ +

← → ↻   https://[fecc::10:1]/pkg_mgr.php   

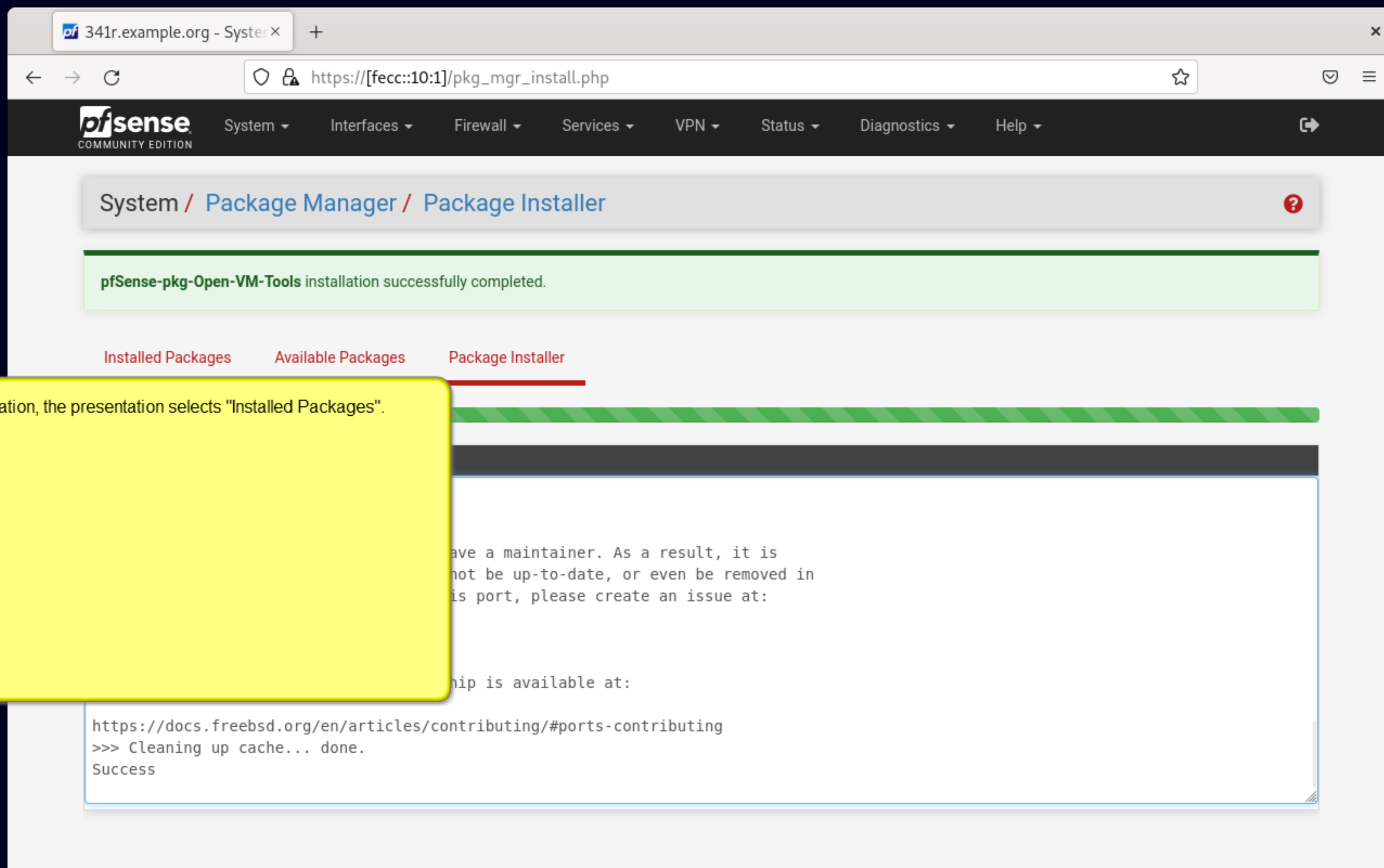
Open-VM-Tools	10.1.0_5,1	VMware Tools is a suite of utilities that enhances the performance of the virtual machine's guest operating system and improves management of the virtual machine.	
Package Dependencies: open-vm-tools-11.3.5_1,2			
openvpn-client-export	1.6_4	Allows a pre-configured OpenVPN Windows Client or Mac OS Client to connect to a pfSense.	
Package Dependencies: openvpn-client-export-2.5.2 openvpn-2.5.4_1			
pfBlockerNG	2.1.4_28	pfBlockerNG is the Next Generation of pfBlocker. Manage IPv4/v6 List Sources into 'Deny, Permit or Match' formats. GeolIP database by MaxMind Inc. (GeoLite2 Free version). De-Duplication, Suppression, and Reputation enhancements. Provision to download from diverse List formats. Advanced Integration for Proofpoint ET IQRisk IP Reputation Threat Sources. Domain Name (DNSBL) blocking via Unbound DNS Resolver.	
Package Dependencies: lighttpd-1.4.63 whois-5.5.7 libmaxminddb-1.6.0 grepcidr-2.0 aggregate-1.6_1 php74-7.4.26 php74-intl-7.4.26			
pfBlockerNG-devel	3.1.0_5	pfBlockerNG-devel is the Next Generation of pfBlockerNG. Manage IPv4/v6 List Sources into 'Deny, Permit or Match' formats. GeolIP database by MaxMind Inc. (GeoLite2 Free version). De-Duplication, Suppression, and Reputation enhancements. Provision to download from diverse List formats. Advanced Integration for Proofpoint ET IQRisk IP Reputation Threat Sources. Domain Name (DNSBL) blocking via Unbound DNS Resolver.	
Package Dependencies: lighttpd-1.4.63 jq-1.6 whois-5.5.7 rsync-3.2.3_1 py-maxminddb-2.0.3 libmaxminddb-1.6.0 iprange-1.0.4 grepcidr-2.0 python38-3.8.12_1 php74-7.4.26 php74-intl-7.4.26 py-			

The presentation selects "Install" for Open-VM-Tools.

Confirmation Required to install package pfSense-pkg-Open-VM-Tools.

 Confirm

The presentation selects "confirm" to continue.




The screenshot shows a web browser window displaying the pfSense Package Manager interface. The browser's address bar shows the URL `https://[fecc::10:1]/pkg_mgr_install.php`. The page header includes the pfSense logo and navigation menus for System, Interfaces, Firewall, Services, VPN, Status, Diagnostics, and Help. The breadcrumb trail is `System / Package Manager / Package Installer`. A green notification bar at the top states: `pfSense-pkg-Open-VM-Tools installation successfully completed.` Below this, there are three tabs: `Installed Packages`, `Available Packages`, and `Package Installer`. The `Installed Packages` tab is selected. A yellow callout box points to this tab with the text: "After installation, the presentation selects 'Installed Packages'". The main content area shows a terminal window with the following text:



```
have a maintainer. As a result, it is
not be up-to-date, or even be removed in
is port, please create an issue at:

hip is available at:

https://docs.freebsd.org/en/articles/contributing/#ports-contributing
>>> Cleaning up cache... done.
Success
```

341r.example.org - System ▾ +



 System ▾ Interfaces ▾ Firewall ▾ Services ▾ VPN ▾ Status ▾ Diagnostics ▾ Help ▾ 



System / Package Manager / Installed Packages




[Installed Packages](#) [Available Packages](#)

Installed Packages

Name	Category	Version	Description
✓ Open-VM-Tools	emulators	10.1.0_5,1	VMware Tools is a suite of utilities that enhances the performance and improves management of the virtual machine.

Package Dependencies:
[open-vm-tools-11.3.5_1,2](#)

 = Update  = Current

 = Remove  = Information  = Reinstall

Newer version available

Package is configured but not (fully) installed or deprecated

The presentation exits the web configuration system.

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```
preuss@csis341-debian: ~  
preuss@csis341-debian:~$ ping -c 3 sweden.minnesota.edu  
PING sweden.minnesota.edu (134.29.228.100) 56(84) bytes of data.  
64 bytes from sweden.minnesota.edu (134.29.228.100): icmp_seq=1 ttl=127 time=27.9 ms  
64 bytes from sweden.minnesota.edu (134.29.228.100): icmp_seq=2 ttl=127 time=27.1 ms  
64 bytes from sweden.minnesota.edu (134.29.228.100): icmp_seq=3 ttl=127 time=30.0 ms  
  
--- sweden.minnesota.edu ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2010ms  
rtt min/avg/max/mdev = 27.063/28.335/30.023/1.243 ms  
preuss@csis341-debian:~
```

The presentation tests the connection from the internal network through the new router to the Internet.