Virtualization Lab for Closed Network

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목차

1. Hypervisor
2. vRouter
3. Host 설치
   - CentOS 7
   - Ubuntu 16.04
   - QNX

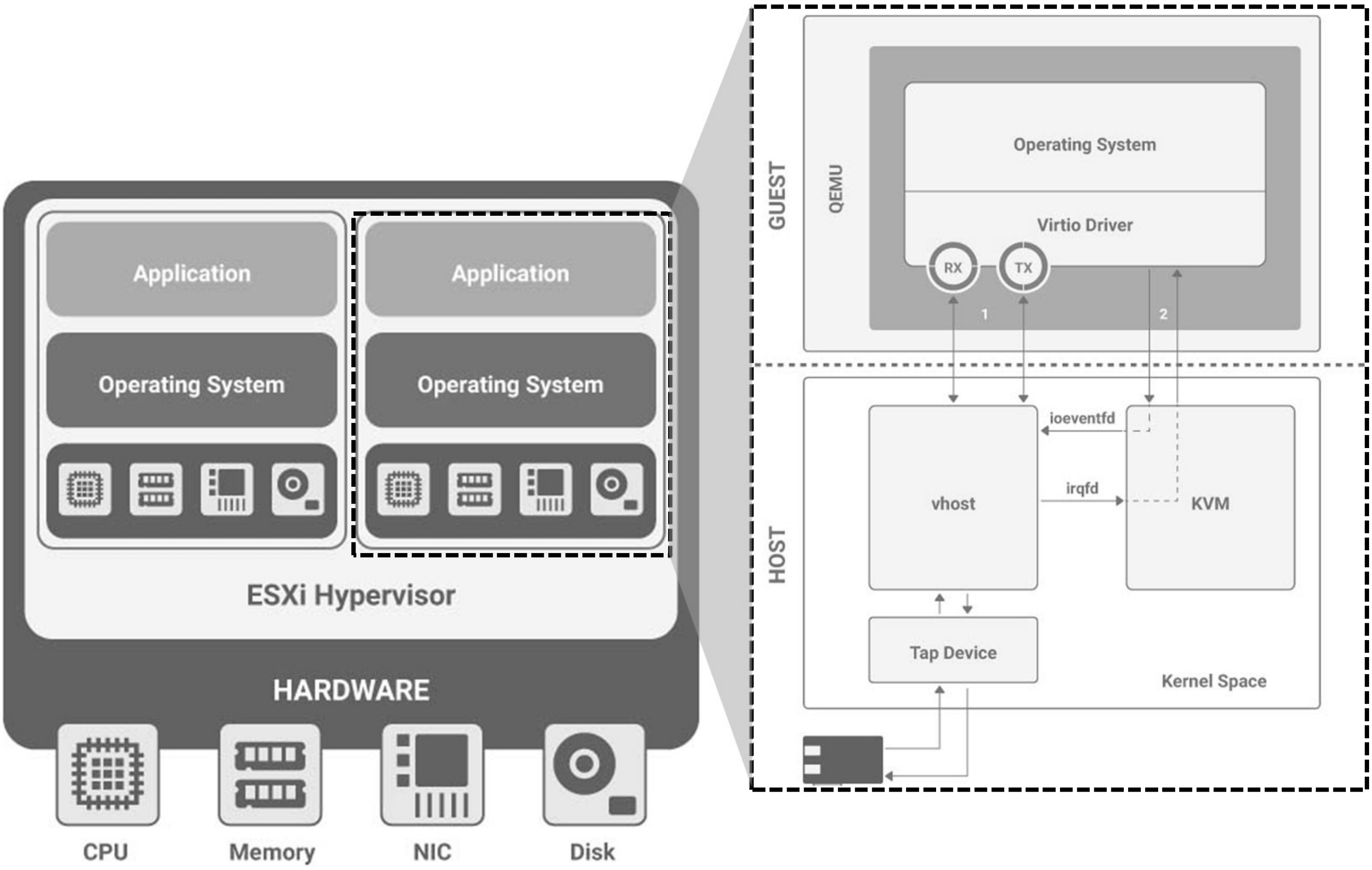
❖ 부록: VMware Lab 운영
   - WorkStation
   - KVM/QEMU
   - vCenter Converter Standalone

1. Hypervisor

❖ Nested Hypervisor 환경 구축

○ Nested Hypervisor 구성

- ✓ **VMware ESXi 6.7**
- ✓ **KVM, QEMU**



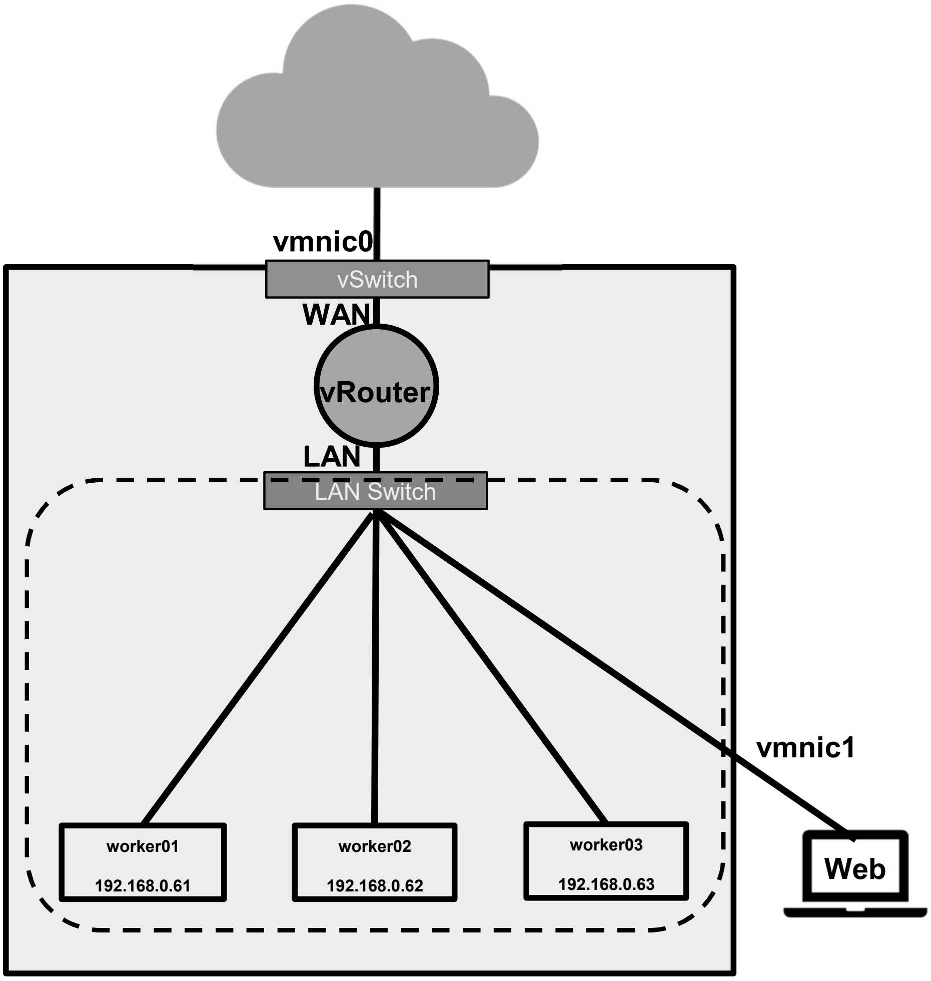
메모:

- Nested Hypervisor 환경: ESXi 하이퍼바이저 상에 KVM/QEMU 하이퍼바이저 적용)

1. Hypervisor

❖ 가상화 운영 인프라 구성 (예)

- ○ **하이퍼바이저 내 인터넷용과 호스트 연결 스위치 2개 사용**
- ○ **WAN은 인터넷, LAN은 호스트 연결 vSwitch 별도 생성**
- ○ **설정을 위한 클라이언트는 VM 또는 별도 연결 PC 사용** (외부 유선랜 연결이 어려운 경우 하이퍼바이저에 웹으로 연결 사용)



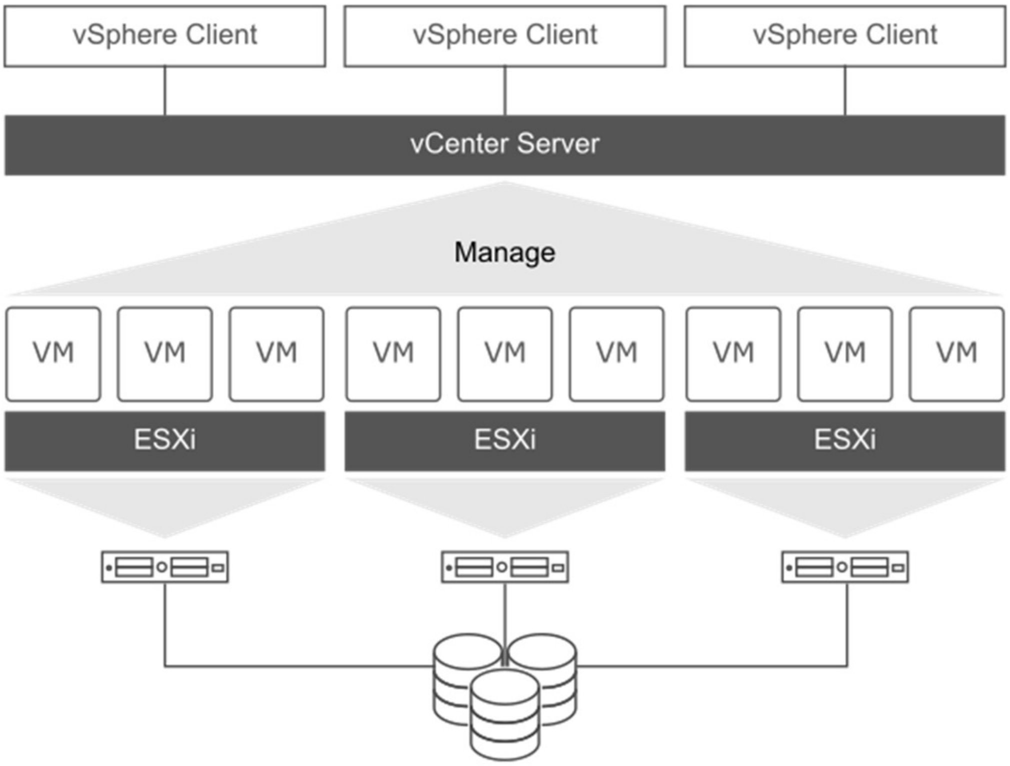
메모:

- vRouter 대체 또는 추가 방화벽 설치 가능
- 복수의 하이퍼바이저 관리를 위한 중앙 관리 도구 사용 가능 (VMware예: vCenter)

1. Hypervisor

❖ 설치를 위한 VMware 환경 구성 요소

- **ESXi**: ESXi is a **hypervisor**, or a type of virtualization software that allows you to create and manage multiple virtual machines using a single physical host.
- **vCenter**: VMware vCenter Server allows for **centralized management** of your virtual infrastructure.



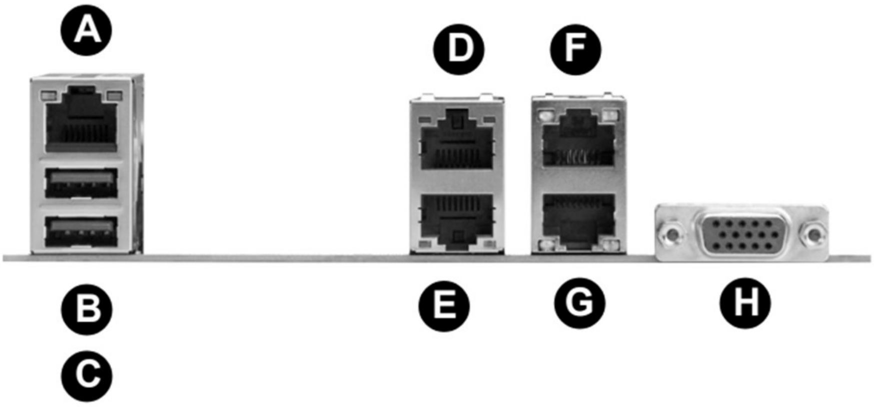
메모:

- vCenter Server Installation and Setup: https://docs.vmware.com/en/VMware-vSphere/6.7/vsphere-vcenter-server-67-installation-guide.pdf

1. Hypervisor

❖ 하이퍼바이저 설치 준비 (슈퍼마이크로서버 예)

- **CPU w/Passive CPU heat sink**
  - ✓ Intel® Xeon® processor D-1528
  - ✓ FCBGA 1667
  - ✓ CPU TDP support 35W, 9MB, 6 Cores, 12 Threads, 1.9-2.2GHz
- **RAM**
- **SSD**
- **IPMI 2.0**
- **10GbE 2포트, 1 GbE LAN 2포트, IPMI 2.0 전용 LAN**
- **SR-IOV** (Single-Root Virtualization)



Back Panel I/O			
A	IPMI LAN	E	LAN Port 1 (-F, -LN2F, -TLN4F)
B	USB Port 1	F	LAN Port 4 (-TLN2F and -TLN4F)
C	USB Port 0	G	LAN Port 3 (-TLN2F and -TLN4F)
D	LAN Port 2 (-F, -LN2F, -TLN4F)	H	VGA Port

메모:

- Low noise fan speed control

1. Hypervisor

❖ **하이퍼바이저 설치 준비** (슈퍼마이크로서버 예)

① **Initial Powering Up (w/o Internet)**

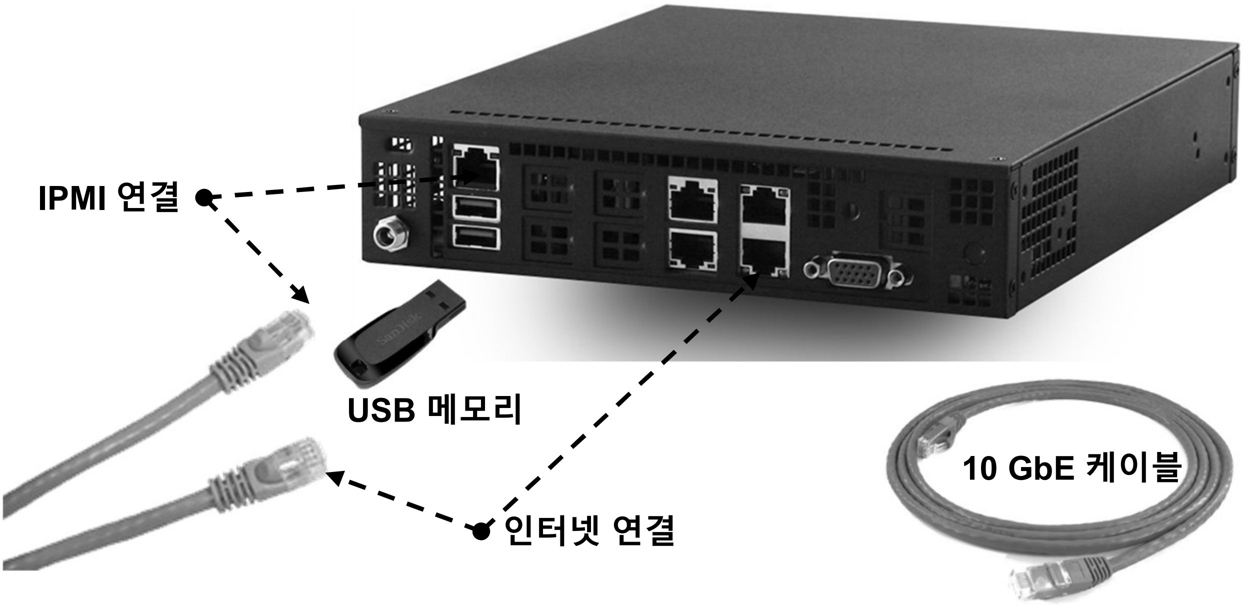
② **USB booting Available**

③ **Alt-Ctrl-D로 Rebooting 하여 install 가능**

④ **Rebooting 시 'F11'에서 USB Booting 선택** (예: SanDisk)

⑤ **ESXi '6.7'** (원격콘솔 VMRC 사용)

⑥ **클라이언트용 노트북 사용** (Putty, WEB 브라우저, VMware vCenter Converter Standalone)



메모:

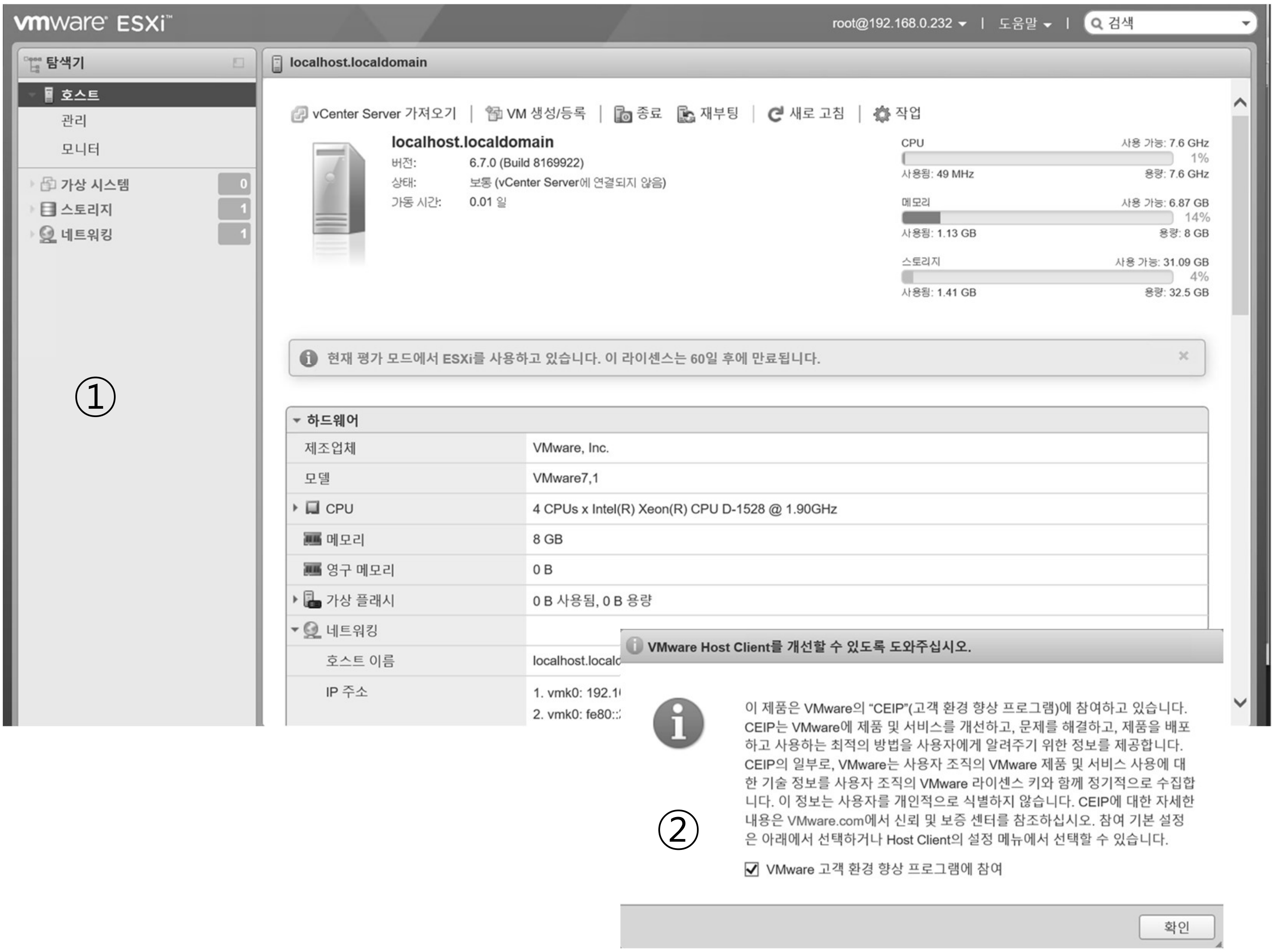
- ESXi 다운로드 주소: https://my.vmware.com/en/web/vmware/evalcenter?p=free-esxi6
- 디스크 이미지 굽기: Rufus 도구 사용 https://rufus.akeo.ie/
- Disk Imager https://sourceforge.net/projects/win32diskimager/files/latest/download
- USB 부팅 제가동은 전원 off/on (전원 케이블 포함)필요함

1. Hypervisor

❖ Hypervisor Installation (웹브라우저 접속)

① 웹 브라우저로 접속: http://192.168.xx.yy

② 개선 프로그램 확인



localhost.localdomain

버전: 6.7.0 (Build 8169922)

상태: 보통 (vCenter Server에 연결되지 않음)

가동 시간: 0.01 일

CPU 사용 가능: 7.6 GHz 1% 사용됨: 49 MHz 용량: 7.6 GHz

메모리 사용 가능: 6.87 GB 14% 사용됨: 1.13 GB 용량: 8 GB

스토리지 사용 가능: 31.09 GB 4% 사용됨: 1.41 GB 용량: 32.5 GB

현재 평가 모드에서 ESXi를 사용하고 있습니다. 이 라이센스는 60일 후에 만료됩니다.

하드웨어

제조업체	VMware, Inc.
모델	VMware7,1
CPU	4 CPUs x Intel(R) Xeon(R) CPU D-1528 @ 1.90GHz
메모리	8 GB
영구 메모리	0 B
가상 플래시	0 B 사용됨, 0 B 용량
네트워킹	
호스트 이름	localhost.localc
IP 주소	1. vmk0: 192.1 2. vmk0: fe80:::

VMware Host Client를 개선할 수 있도록 도와주십시오.

이 제품은 VMware의 “CEIP”(고객 환경 향상 프로그램)에 참여하고 있습니다. CEIP는 VMware에 제품 및 서비스를 개선하고, 문제를 해결하고, 제품을 배포하고 사용하는 최적의 방법을 사용자에게 알려주기 위한 정보를 제공합니다. CEIP의 일부로, VMware는 사용자 조직의 VMware 제품 및 서비스 사용에 대한 기술 정보를 사용자 조직의 VMware 라이센스 키와 함께 정기적으로 수집합니다. 이 정보는 사용자를 개인적으로 식별하지 않습니다. CEIP에 대한 자세한 내용은 VMware.com에서 신뢰 및 보증 센터를 참조하십시오. 참여 기본 설정은 아래에서 선택하거나 Host Client의 설정 메뉴에서 선택할 수 있습니다.

☑ VMware 고객 환경 향상 프로그램에 참여

메모:

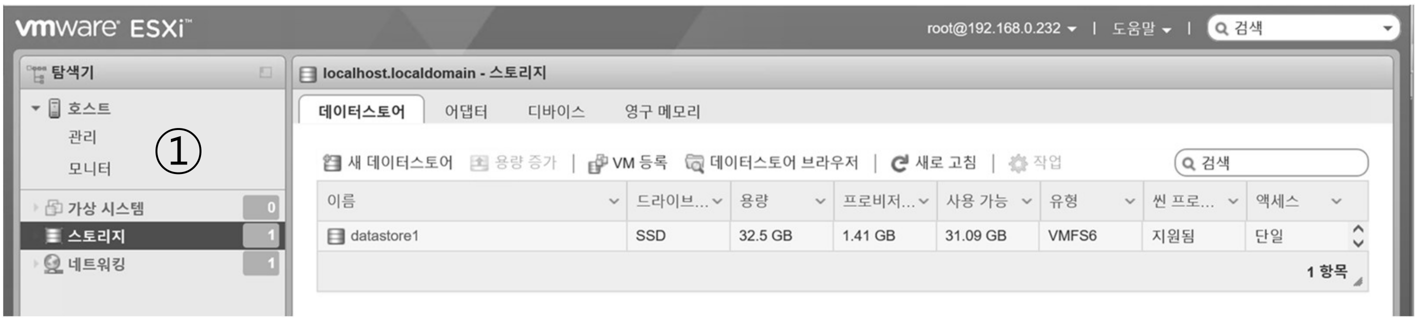
- vCenter 서버 설치 시 vCenter VM에 연결하여 진행 가능

1. Hypervisor

❖ 스토리지 확인

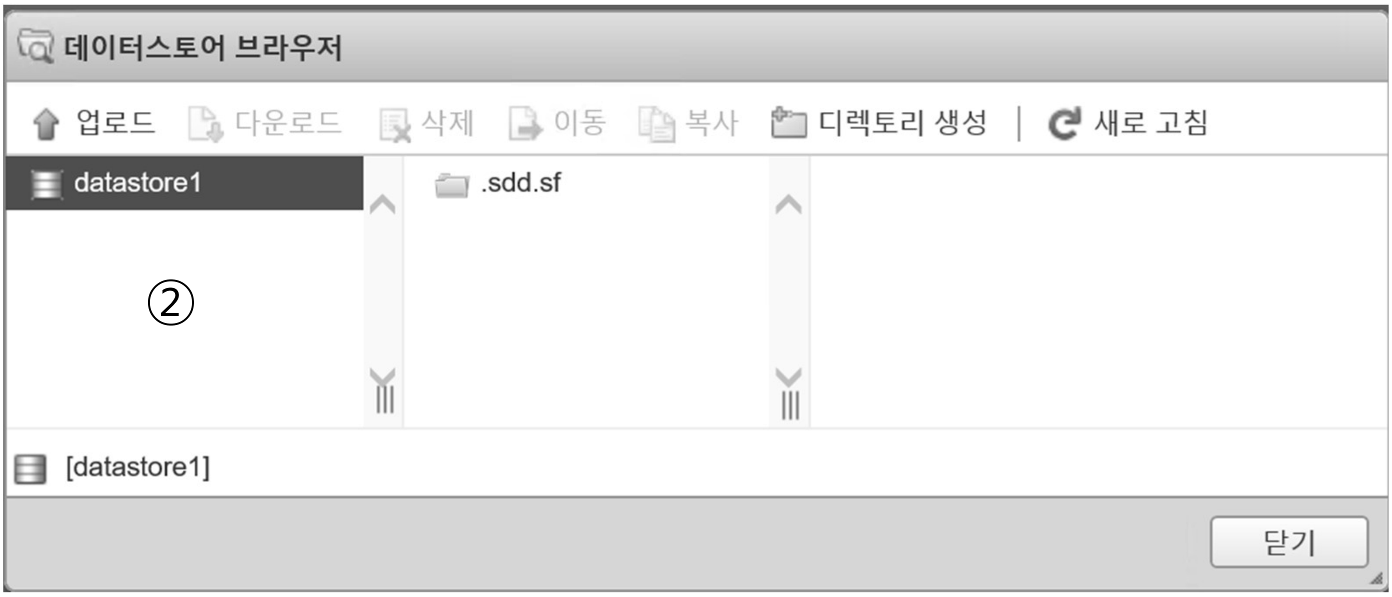
① 스토리지 선택

② 데이터 스토어 브라우저



이름	드라이브...	용량	프로비저...	사용 가능	유형	씬 프로...	액세스
datastore1	SSD	32.5 GB	1.41 GB	31.09 GB	VMFS6	지원됨	단일

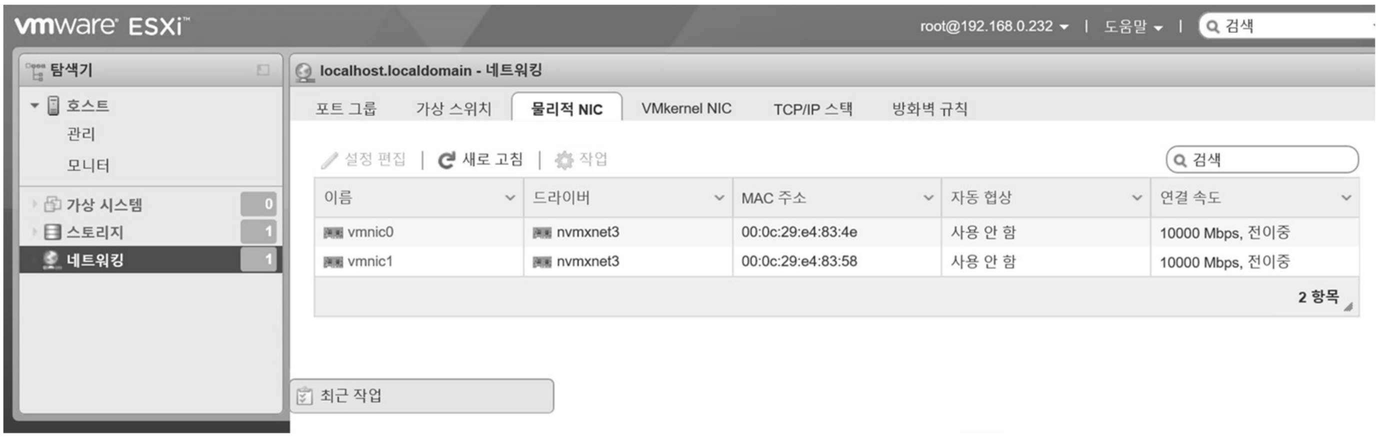
1 항목



메모:

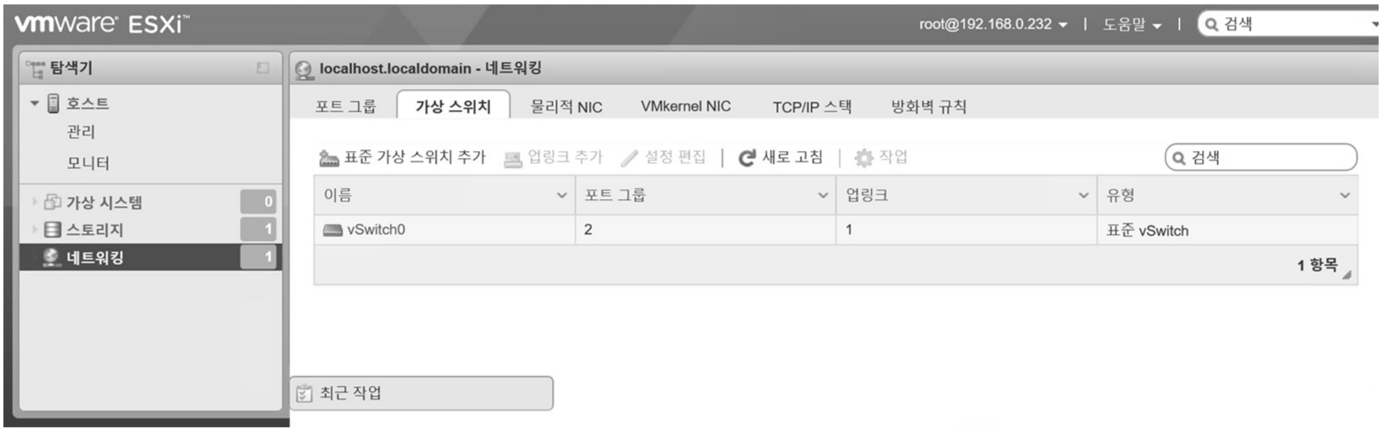
1. Hypervisor

❖ 네트워킹 (pNIC, vNIC, vSwitch, Port Group등)



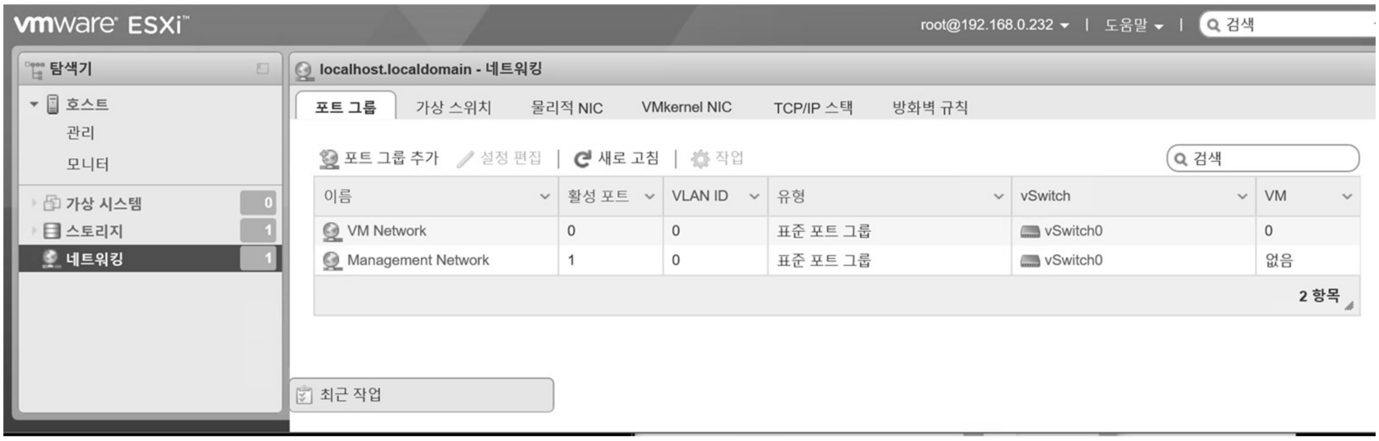
이름	드라이버	MAC 주소	자동 협상	연결 속도
vmnic0	nvmxnet3	00:0c:29:e4:83:4e	사용 안 함	10000 Mbps, 전이중
vmnic1	nvmxnet3	00:0c:29:e4:83:58	사용 안 함	10000 Mbps, 전이중

2 항목



이름	포트 그룹	업링크	유형
vSwitch0	2	1	표준 vSwitch

1 항목



이름	활성 포트	VLAN ID	유형	vSwitch	VM
VM Network	0	0	표준 포트 그룹	vSwitch0	0
Management Network	1	0	표준 포트 그룹	vSwitch0	없음

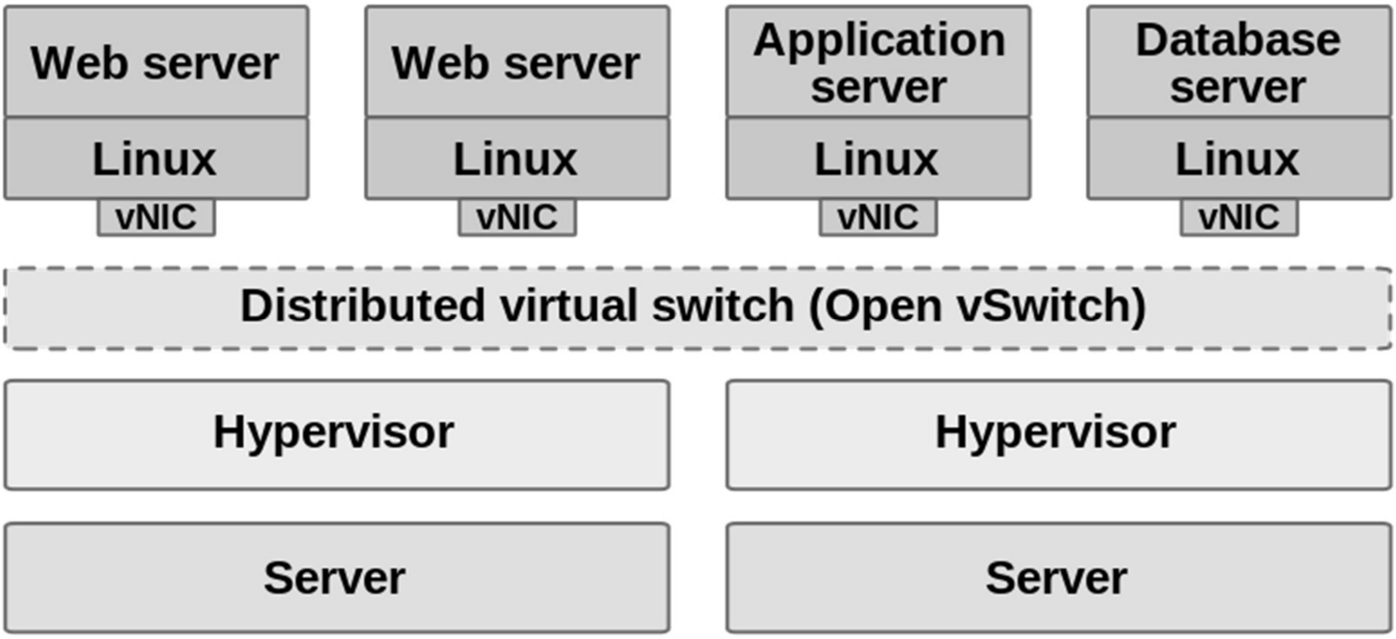
2 항목

메모:

- Multi Host 구성 시 분산스위치 사용 가능

1. Hypervisor

❖ Distributed Open vSwitch Instance (멀티 호스트 환경)



- Visibility into inter-VM communication via NetFlow, sFlow(R), IPFIX, SPAN, RSPAN, and GRE-tunnelled mirrors
- LACP (IEEE 802.1AX-2008)
- Standard 802.1Q VLAN model with trunking
- Multicast snooping
- IETF Auto-Attach SPBM and rudimentary required LLDP support
- BFD and 802.1ag link monitoring
- STP (IEEE 802.1D-1998) and RSTP (IEEE 802.1D-2004)
- Fine-grained QoS control
- Support for HFSC qdisc
- Per VM interface traffic policing
- NIC bonding with source-MAC load balancing, active backup, and L4 hashing
- OpenFlow protocol support (including many extensions for virtualization)
- IPv6 support
- Multiple tunnelling protocols (GRE, VXLAN, STT, and Geneve, with IPsec support)
- Remote configuration protocol with C and Python bindings
- Kernel and user-space forwarding engine options
- Multi-table forwarding pipeline with flow-caching engine
- Forwarding layer abstraction to ease porting to new software and hardware platforms

메모:

1. Hypervisor

❖ 가상스위치 설정(vSwitch)

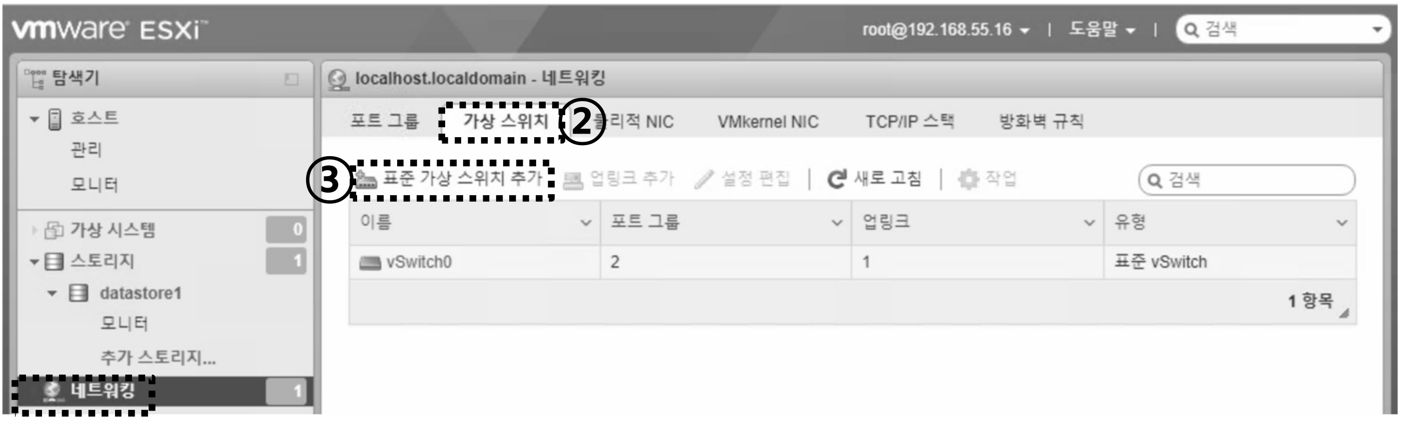
① **네트워킹(Networking) 선택 확인**

② **가상스위치 선택**

③ **표준 가상 스위치 추가**

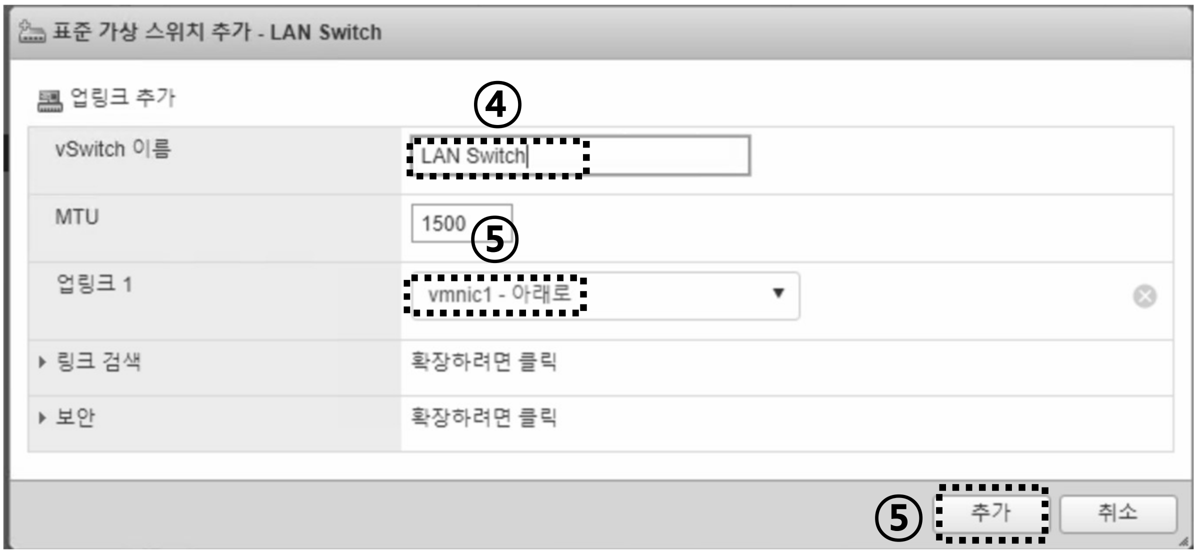
④ **이름 'LAN Switch' 설정**

⑤ **업링크 'vmnic1' 확인 → 추가 단추**



이름	포트 그룹	업링크	유형
vSwitch0	2	1	표준 vSwitch

1 항목

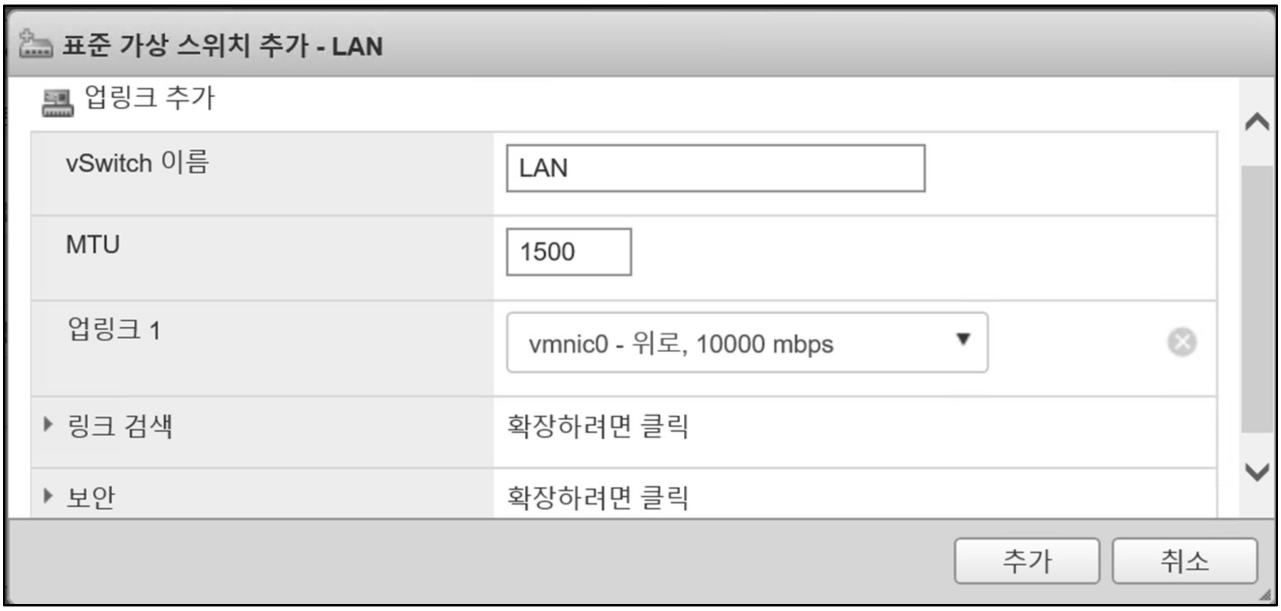


vSwitch 이름	LAN Switch
MTU	1500
업링크 1	vmnic1 - 아래로 ▾
▸ 링크 검색	확장하려면 클릭
▸ 보안	확장하려면 클릭

메모:

1. Hypervisor

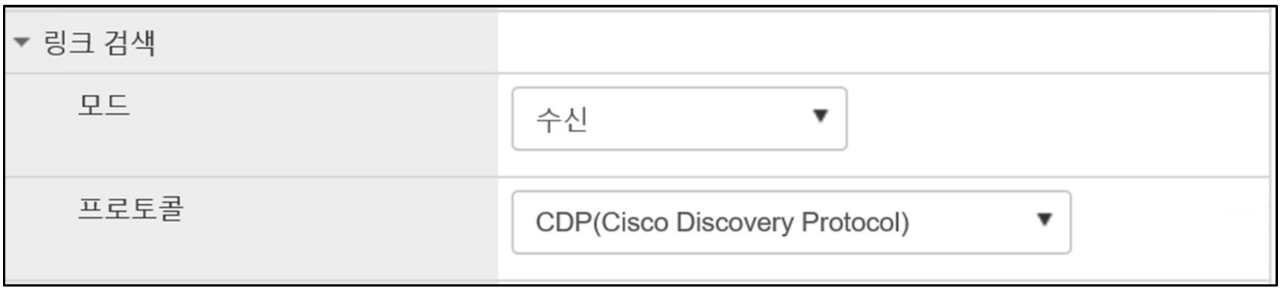
❖ 가상스위치 상세 (보안 확인)



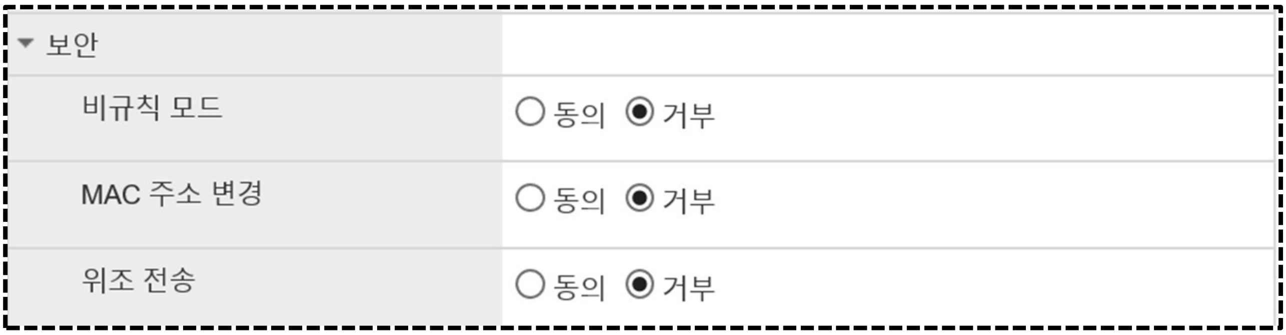
표준 가상 스위치 추가 - LAN

업링크 추가

vSwitch 이름	LAN
MTU	1500
업링크 1	vmnic0 - 위로, 10000 mbps ▼
▸ 링크 검색	확장하려면 클릭
▸ 보안	확장하려면 클릭



▾ 링크 검색	
모드	수신 ▼
프로토콜	CDP(Cisco Discovery Protocol) ▼



▾ 보안	
비규칙 모드	○ 동의 ● 거부
MAC 주소 변경	○ 동의 ● 거부
위조 전송	○ 동의 ● 거부

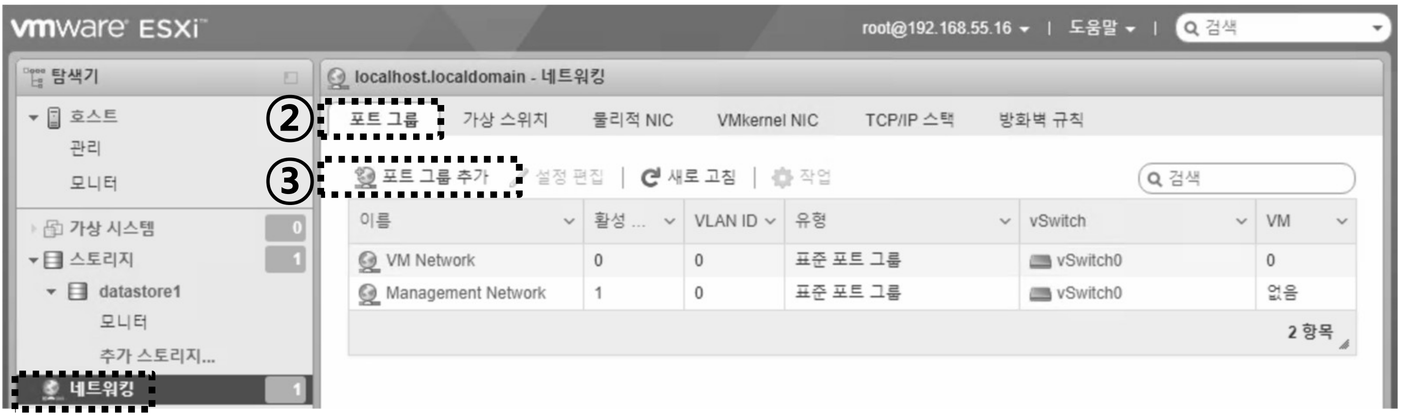
메모:

- Nested Hypervisor는 보안 기능을 모두 동의 권장
- 보안 항목 동의하여 스위치 트래픽 분석을 위한 미러링 용도로 이용 가능

1. Hypervisor

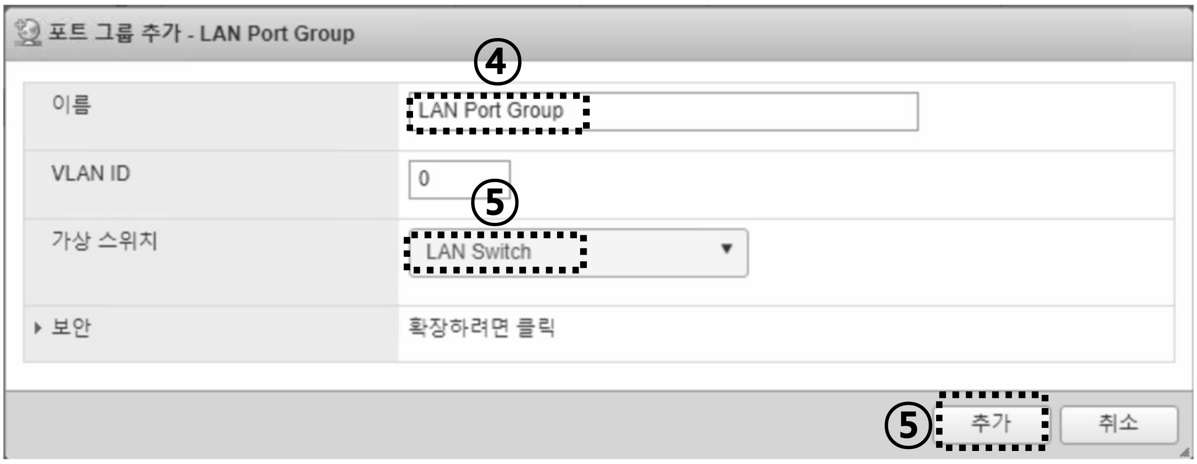
❖ 포트그룹 설정

① 네트워킹(Networking) 선택 확인
② 포트 그룹 선택
③ 포트 그룹 추가
④ 이름 'LAN Port Group' 설정
⑤ 가상 스위치 'LAN Switch' 확인 → 추가 단추



이름	활성 ...	VLAN ID	유형	vSwitch	VM
VM Network	0	0	표준 포트 그룹	vSwitch0	0
Management Network	1	0	표준 포트 그룹	vSwitch0	없음

2 항목



이름	LAN Port Group
VLAN ID	0
가상 스위치	LAN Switch ▾
▸ 보안	확장하려면 클릭

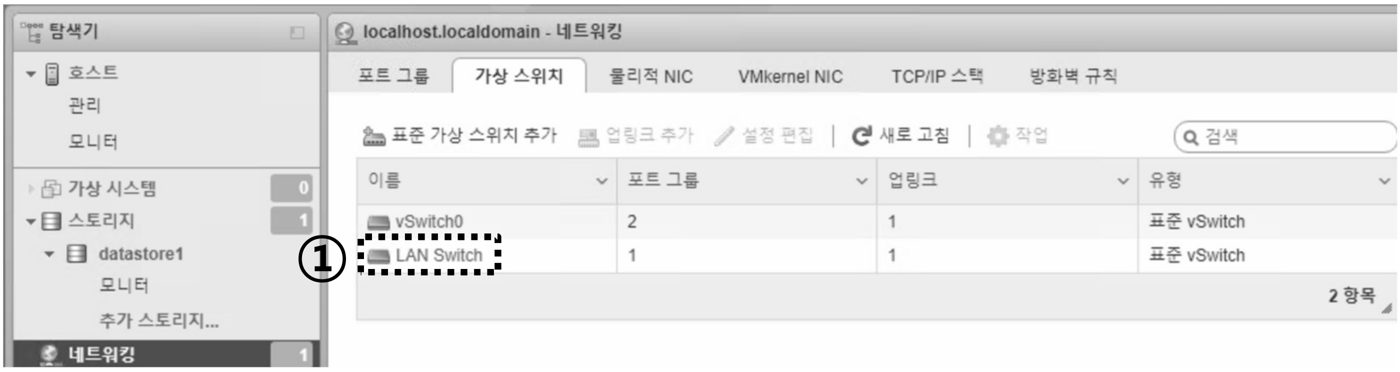
메모:

1. Hypervisor

❖ 스위치/포트 확인

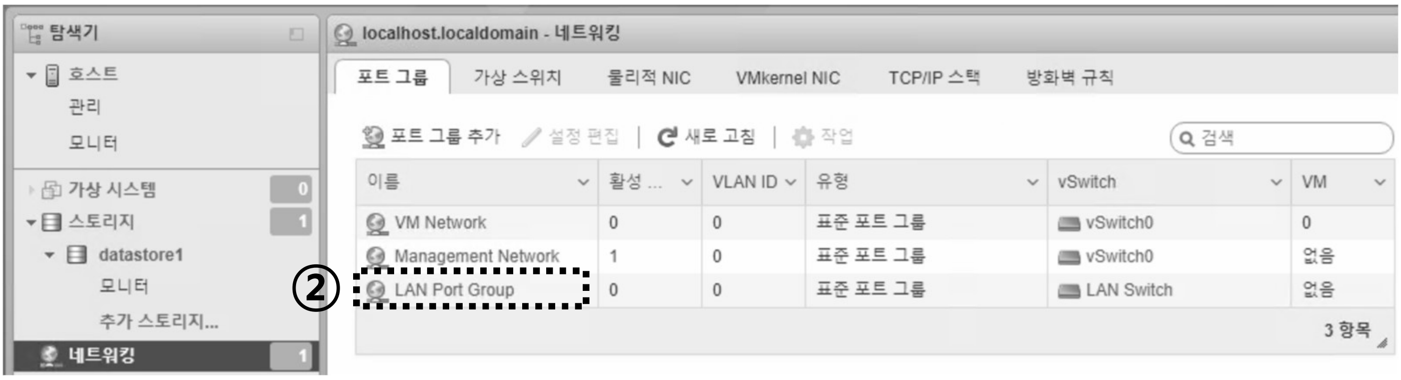
① 생성 가상 스위치 ‘LAN Switch’ 확인

② 생성 포트 그룹 ‘LAN Port Group’ 확인



이름	포트 그룹	업링크	유형
vSwitch0	2	1	표준 vSwitch
LAN Switch	1	1	표준 vSwitch

2 항목



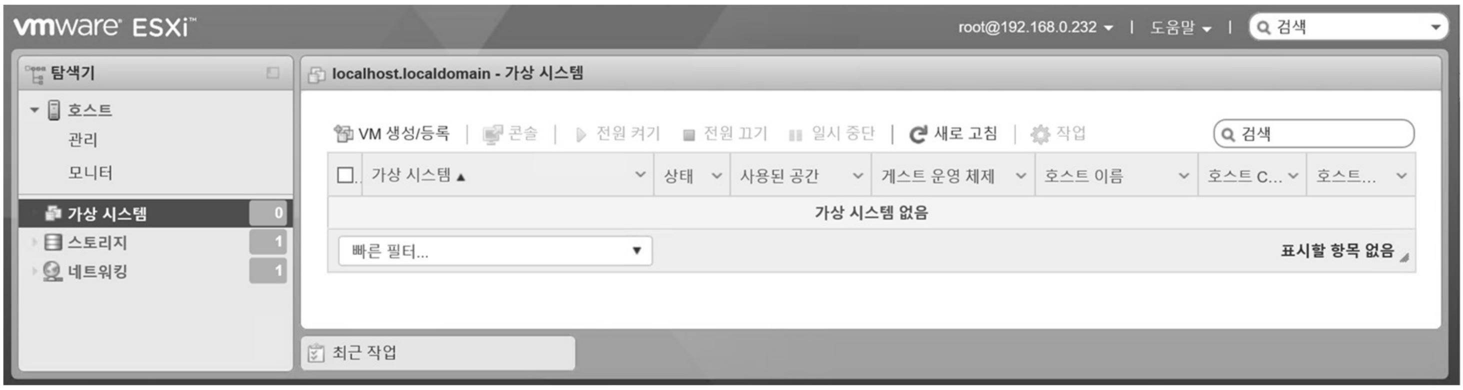
이름	활성 ...	VLAN ID	유형	vSwitch	VM
VM Network	0	0	표준 포트 그룹	vSwitch0	0
Management Network	1	0	표준 포트 그룹	vSwitch0	없음
LAN Port Group	0	0	표준 포트 그룹	LAN Switch	없음

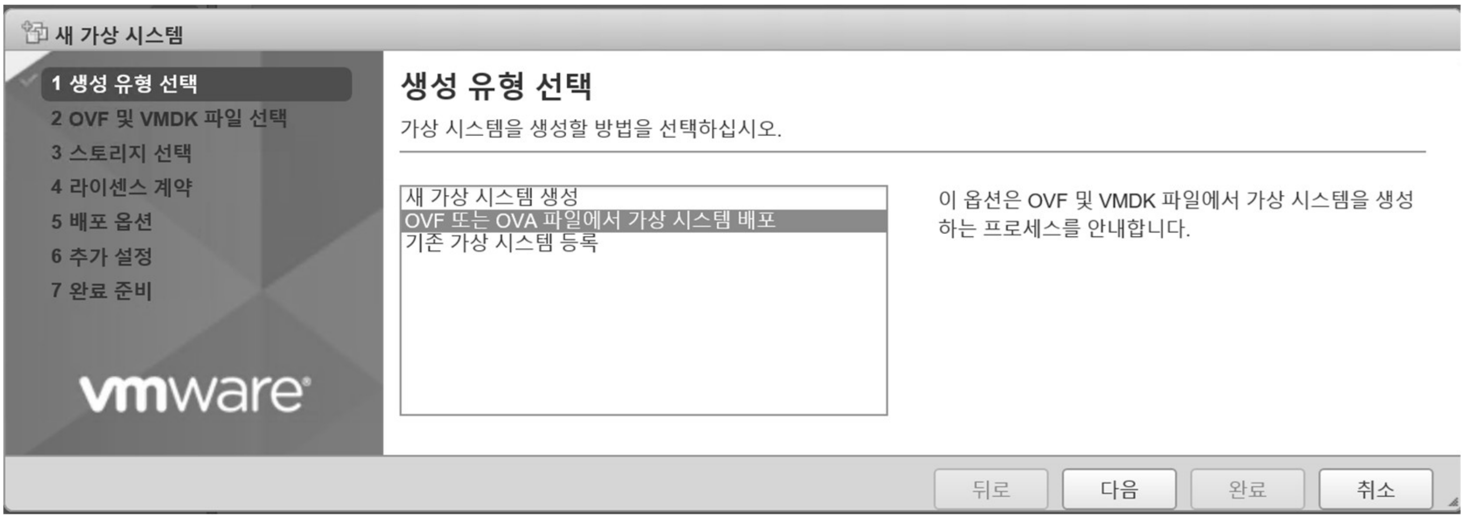
3 항목

메모:

1. Hypervisor

❖ VM 생성





생성 유형 선택

가상 시스템을 생성할 방법을 선택하십시오.

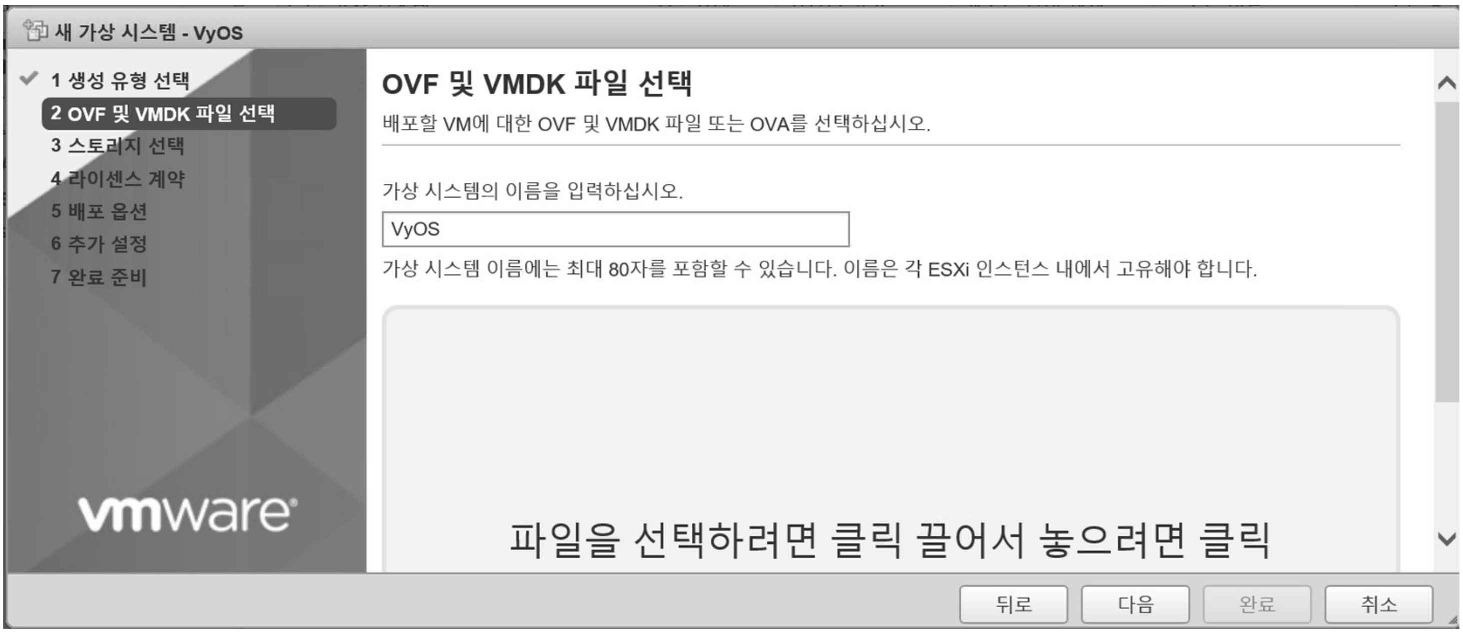
- 새 가상 시스템 생성
- OVF 또는 OVA 파일에서 가상 시스템 배포
- 기존 가상 시스템 등록

이 옵션은 OVF 및 VMDK 파일에서 가상 시스템을 생성하는 프로세스를 안내합니다.

메모:

1. Hypervisor

❖ VMware의 VM 이미지 'VyOS' 사용 VM 생성



새 가상 시스템 - VyOS

OVF 및 VMDK 파일 선택

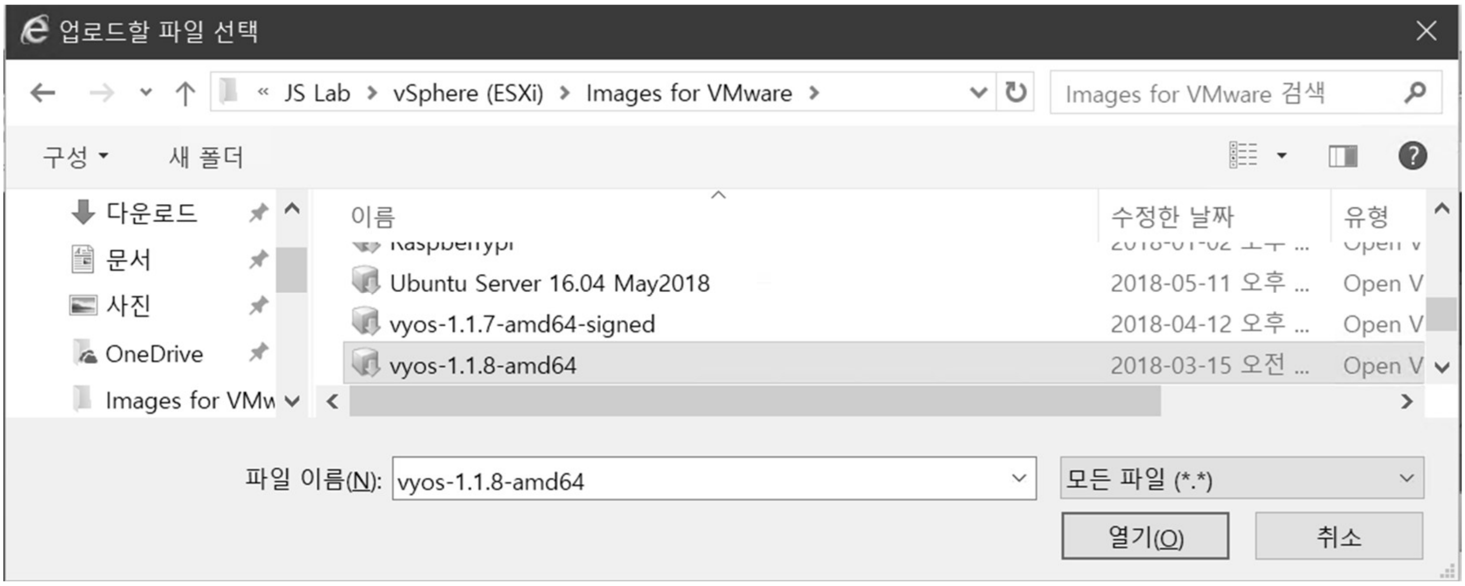
배포할 VM에 대한 OVF 및 VMDK 파일 또는 OVA를 선택하십시오.

가상 시스템의 이름을 입력하십시오.

VyOS

가상 시스템 이름에는 최대 80자를 포함할 수 있습니다. 이름은 각 ESXi 인스턴스 내에서 고유해야 합니다.

파일을 선택하려면 클릭 끌어서 놓으려면 클릭



업로드할 파일 선택

이름	수정한 날짜	유형
Raspberrypi	2018-01-02 오후 ...	Open V
Ubuntu Server 16.04 May2018	2018-05-11 오후 ...	Open V
vyos-1.1.7-amd64-signed	2018-04-12 오후 ...	Open V
vyos-1.1.8-amd64	2018-03-15 오전 ...	Open V

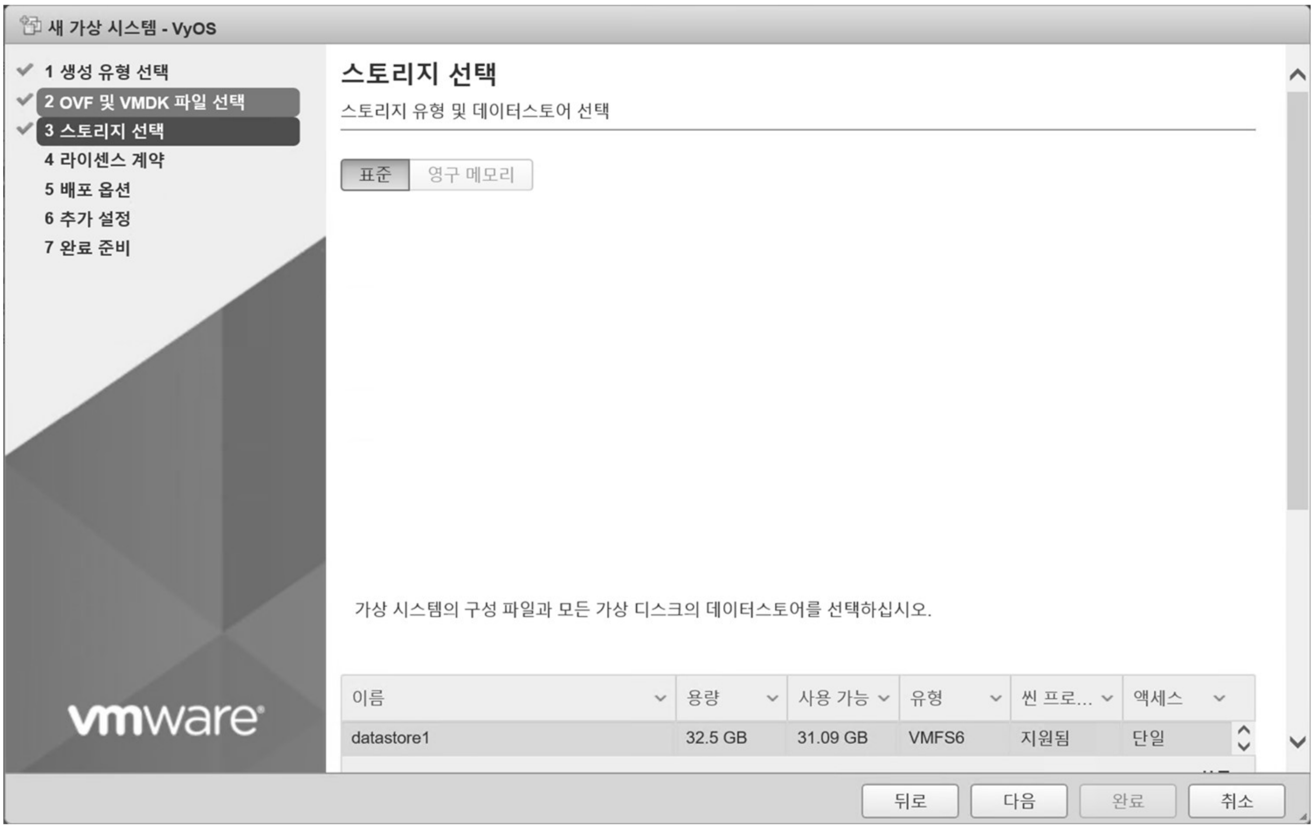
파일 이름(N): vyos-1.1.8-amd64

모든 파일 (*.*)

메모:

- 라우터 VyOS 이미지 다운로드: https://downloads.vyos.io/?dir=release/1.1.8
- VMware OVA 탬플릿 이미지 사용 가능 (예: vyos-1.1.8-amd64.ova, 약 230 MB)

❖ VM 생성 설치 위치 지정 및 네트워크 매핑



새 가상 시스템 - VyOS

1 생성 유형 선택
2 OVF 및 VMDK 파일 선택
3 스토리지 선택
4 라이센스 계약
5 배포 옵션
6 추가 설정
7 완료 준비

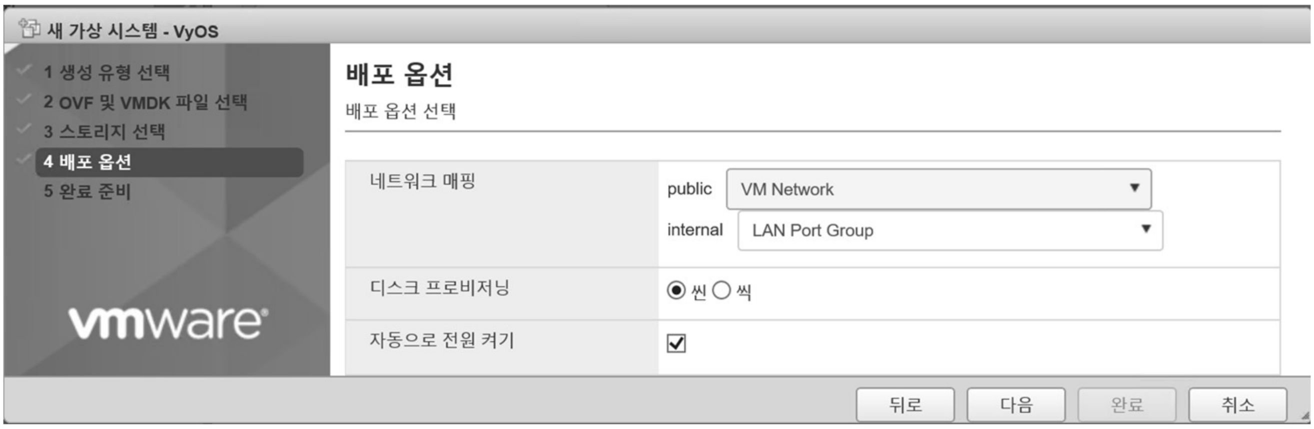
스토리지 선택

스토리지 유형 및 데이터스토어 선택

표준 | 영구 메모리

가상 시스템의 구성 파일과 모든 가상 디스크의 데이터스토어를 선택하십시오.

이름	용량	사용 가능	유형	씬 프로...	액세스
datastore1	32.5 GB	31.09 GB	VMFS6	지원됨	단일



새 가상 시스템 - VyOS

1 생성 유형 선택
2 OVF 및 VMDK 파일 선택
3 스토리지 선택
4 배포 옵션
5 완료 준비

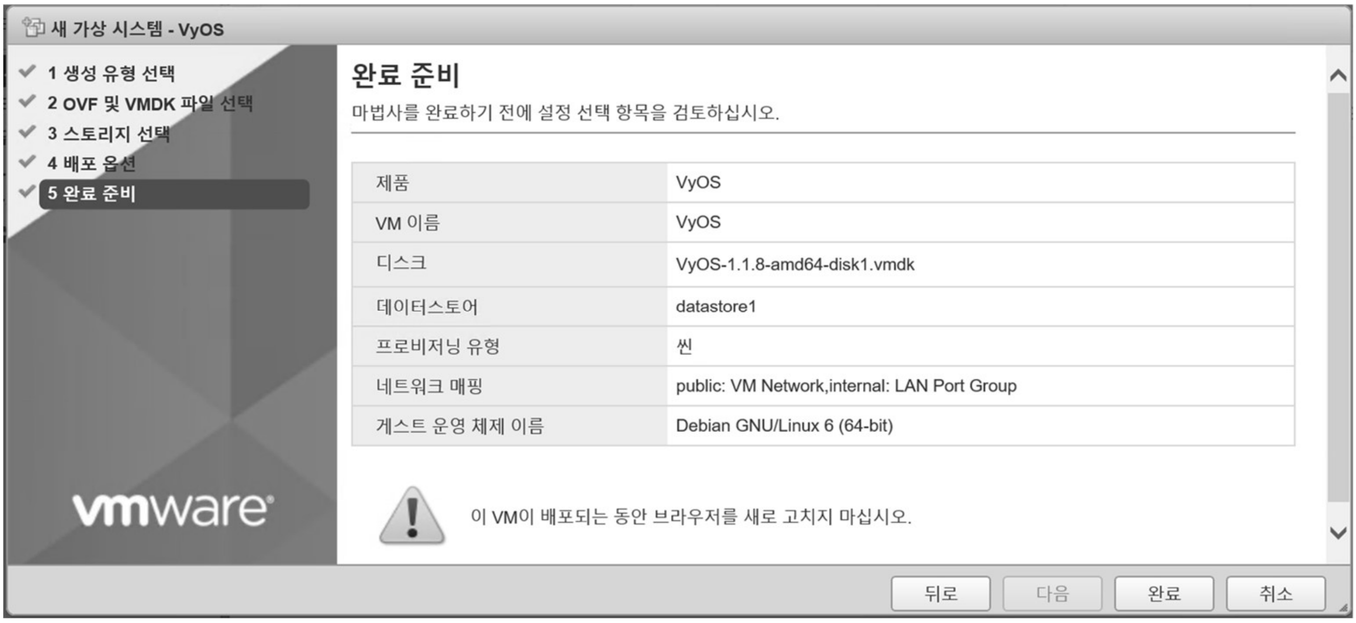
배포 옵션

배포 옵션 선택

네트워크 매핑	public: VM Network internal: LAN Port Group
디스크 프로비저닝	● 씬 ○ 씩
자동으로 전원 켜기	☑

메모:

❖ VM 생성 완료



완료 준비

마법사를 완료하기 전에 설정 선택 항목을 검토하십시오.

제품	VyOS
VM 이름	VyOS
디스크	VyOS-1.1.8-amd64-disk1.vmdk
데이터스토어	datastore1
프로비저닝 유형	씬
네트워크 매핑	public: VM Network,internal: LAN Port Group
게스트 운영 체제 이름	Debian GNU/Linux 6 (64-bit)

이 VM이 배포되는 동안 브라우저를 새로 고치지 마십시오.

메모:

1. **Hypervisor**
2. **vRouter**
3. **Host 설치**
    - **CentOS 7**
    - **Ubuntu 16.04**
    - **QNX**

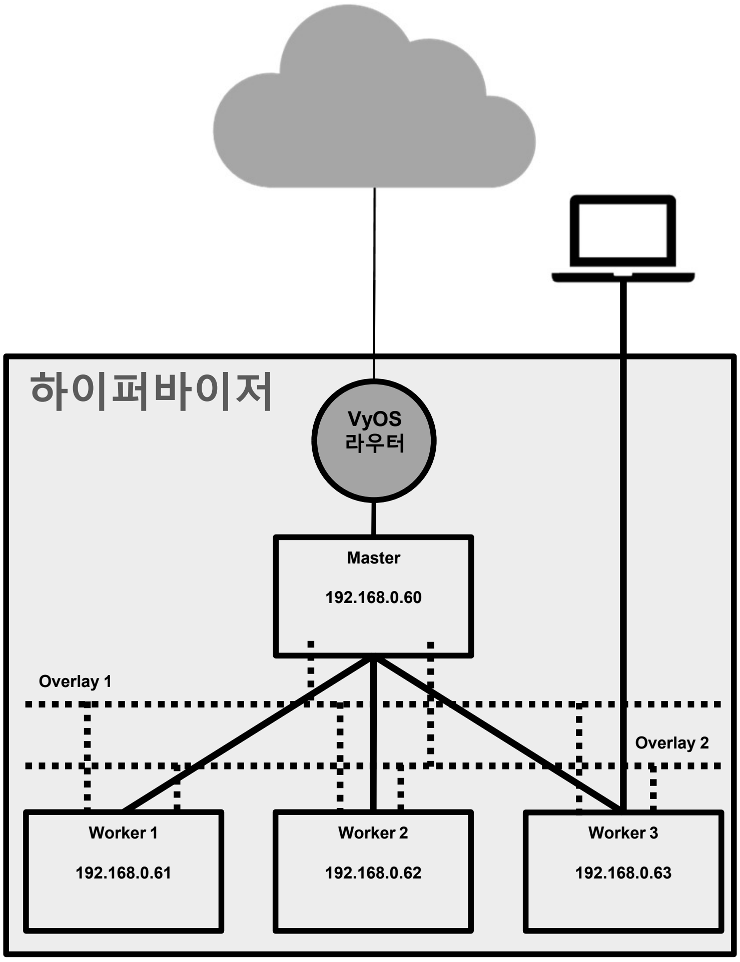
❖ **부록: VMware Lab 운영**

- **WorkStation**
- **KVM/QEMU**
- **vCenter Converter Standalone**

2. vRouter

❖ 라우터 'VyOS' 설치 환경

① **하이퍼바이저 내 인터넷용과 호스트 연결 스위치 2개 필요**
② **라우터 WAN은 인터넷 스위치, LAN은 호스트 연결 스위치**
③ **설정을 위한 클라이언트는 VM 또는 유선랜 연결 PC 사용**



메모:

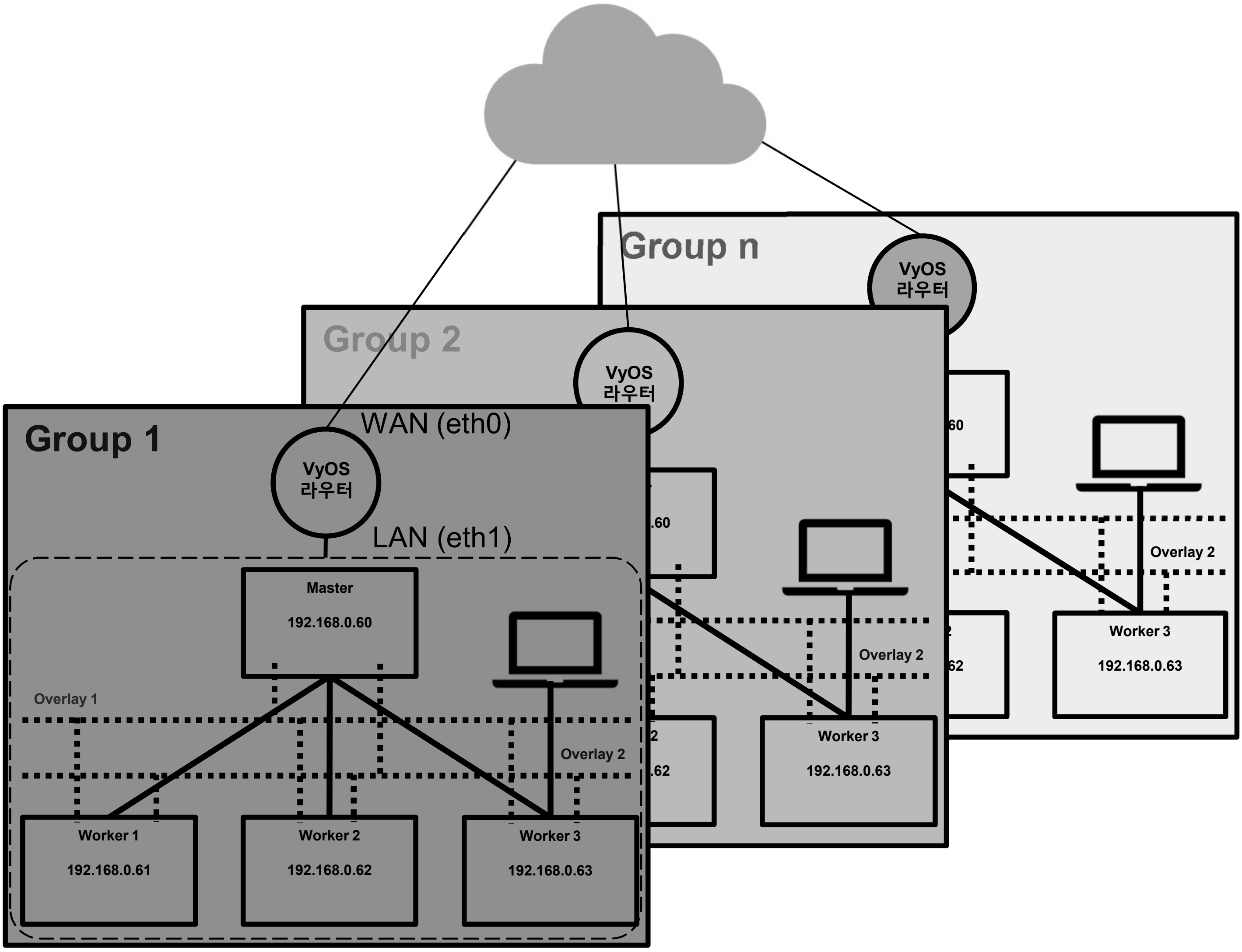
- 라우터는 운영 중 발생 가능한 Loop와 코어 네트워크의 DHCP 서버의 부담을 낮춤
- 라우터 VyOS 이미지 다운로드: https://downloads.vyos.io/?dir=release/1.1.8
- VMware OVA 템플릿 이미지 사용 가능 (예: vyos-1.1.8-amd64.ova, 약 230 MB)

2. vRouter

❖ 라우터 'VyOS' 설치 환경

① 하이퍼바이저 내 인터넷용과 호스트 연결 스위치 2개 필요

② 라우터의 WAN은 인터넷 스위치, LAN은 호스트 연결 스위치 접속



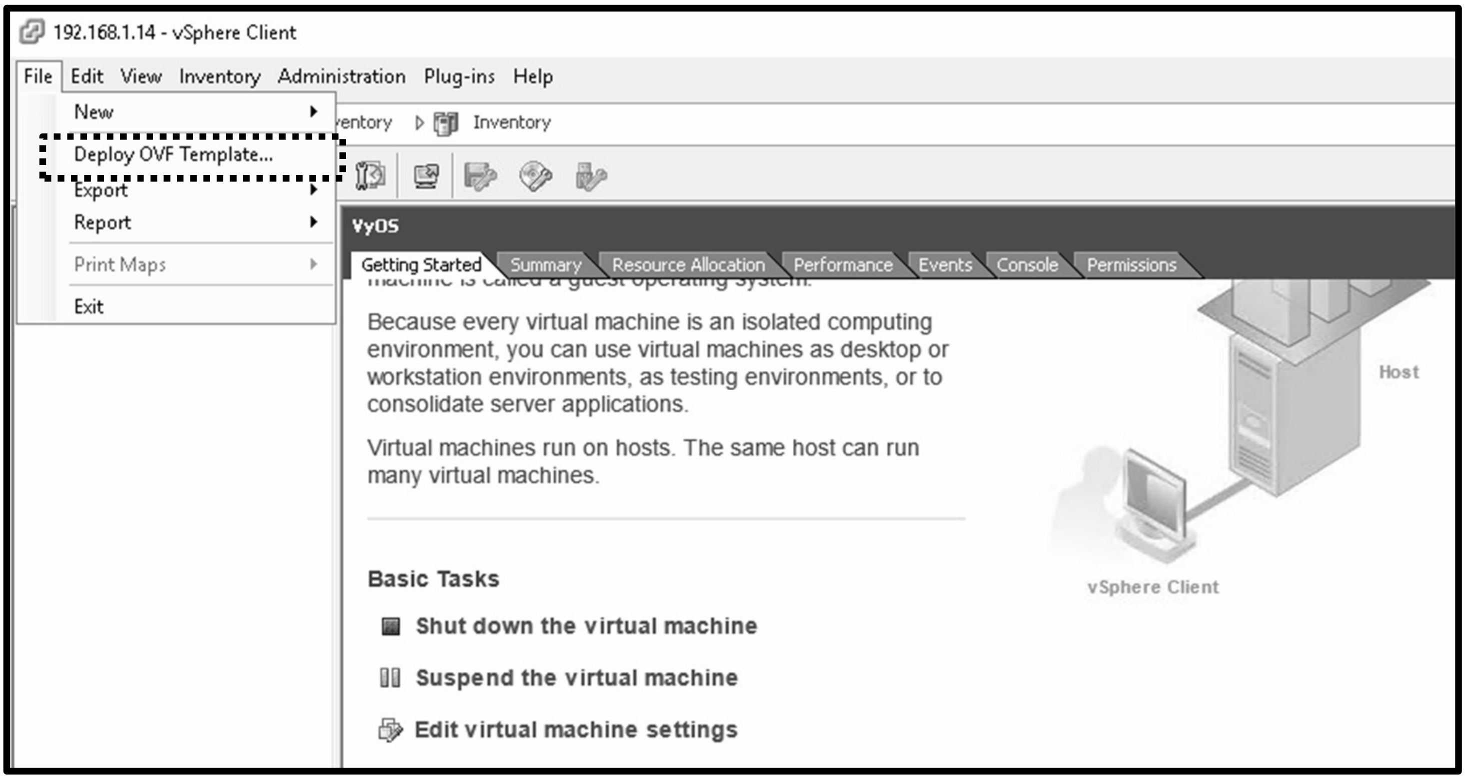
메모:

- 호스트용 CentOS 이미지 : http://isoredirect.centos.org/centos/7/isos/x86_64/CentOS-7-x86_64-Minimal-1708.iso (폐쇄 환경 시 초기설치 완료한 이미지 사용)

❖ Router(VyOS) Installation

① ‘File’ 선택

② ‘Deploy OVF Template’ 선택



Because every virtual machine is an isolated computing environment, you can use virtual machines as desktop or workstation environments, as testing environments, or to consolidate server applications.

Virtual machines run on hosts. The same host can run many virtual machines.

Basic Tasks

- Shut down the virtual machine
- Suspend the virtual machine
- Edit virtual machine settings

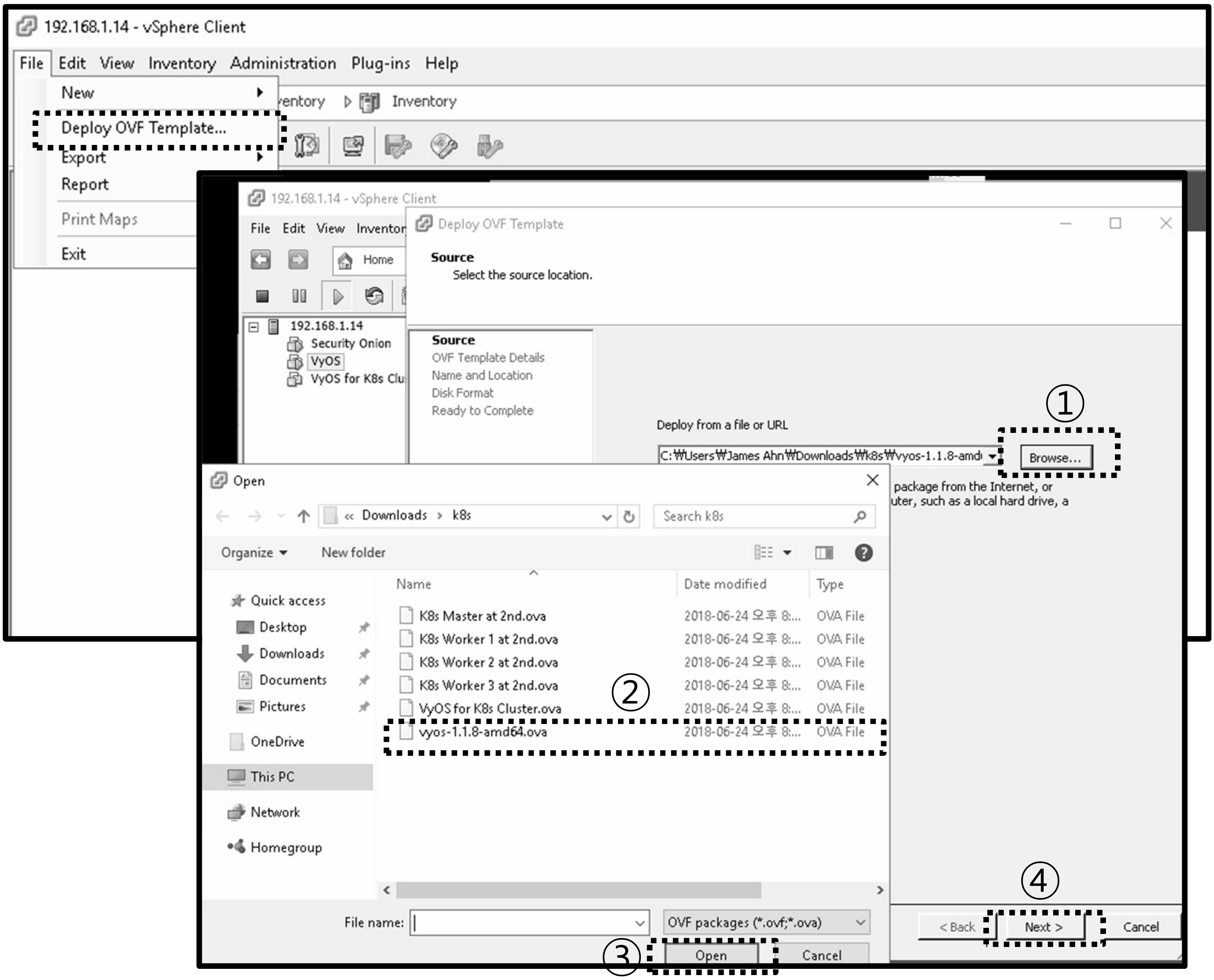
메모:

2. vRouter

❖ Router(VyOS) Installation

① **VyOS OVA 선택**

② **유선랜 네트워크 연결** (내부 네트워크를 위한 선택)

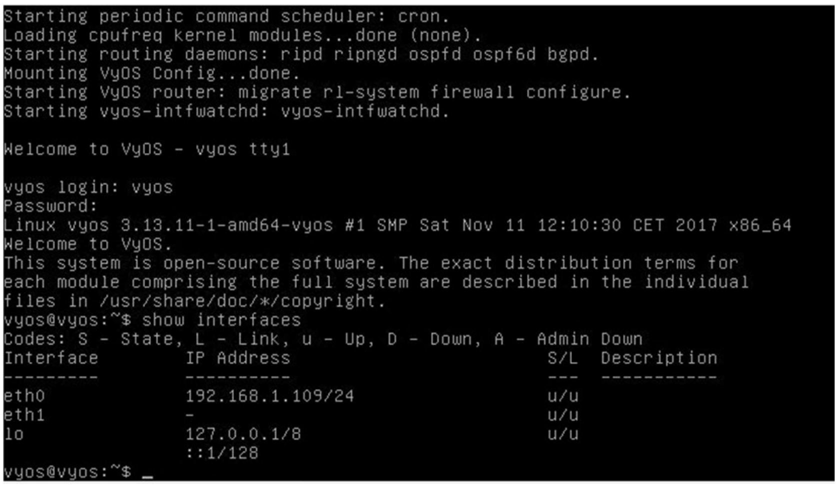


메모:

2. vRouter

❖ 라우터 'VyOS' 설치를 위한 접속

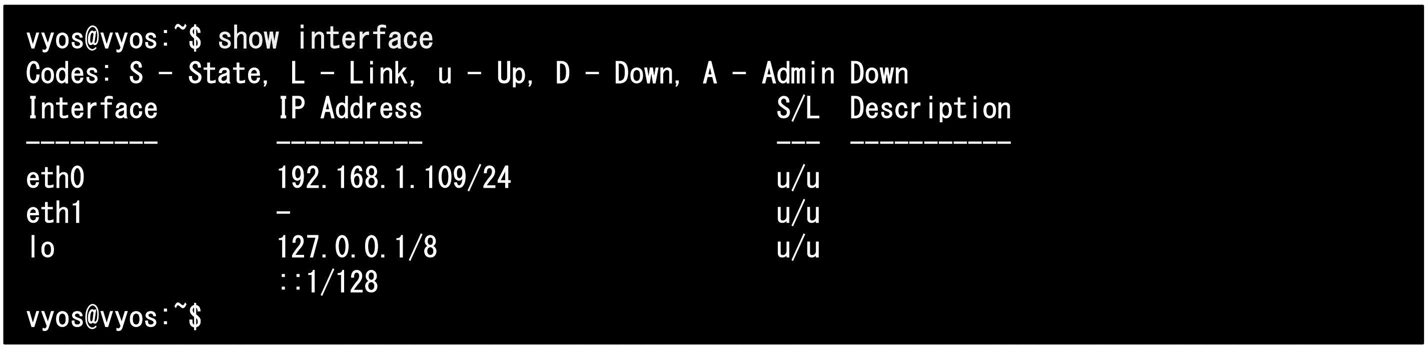
① **계정: ID / Password (vyos/vyos) 호스트 연결 스위치 접속**
② **configure**
③ **set service ssh**
④ **commit**
⑤ **save**
⑥ **exit**
⑦ **show interface** (eth0의 DHCP 서버 할당 IP 주소 사용)
⑧ **Putty 등으로 접속**



```
Starting periodic command scheduler: cron.
Loading cpufreq kernel modules...done (none).
Starting routing daemons: ripd ripngd ospfd ospf6d bgpd.
Mounting VyOS Config...done.
Starting VyOS router: migrate rl-system firewall configure.
Starting vyos-intfwatchd: vyos-intfwatchd.

Welcome to VyOS - vyos tty1

vyos login: vyos
Password:
Linux vyos 3.13.11-1-amd64-vyos #1 SMP Sat Nov 11 12:10:30 CET 2017 x86_64
Welcome to VyOS.
This system is open-source software. The exact distribution terms for
each module comprising the full system are described in the individual
files in /usr/share/doc/*/copyright.
vyos@vyos:~$ show interfaces
Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down
Interface        IP Address                        S/L  Description
---------        ----------                        ---  -----------
eth0             192.168.1.109/24                  u/u
eth1             -                                 u/u
lo               127.0.0.1/8                       u/u
                 ::1/128
vyos@vyos:~$ _
```

가상 라우터 VyOS 터미널 접속 (예)

가상 라우터 VyOS에 SSH 접속 (예)



```
vyos@vyos:~$ show interface
Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down
Interface        IP Address                        S/L  Description
---------        ----------                        ---  -----------
eth0             192.168.1.109/24                  u/u
eth1             -                                 u/u
lo               127.0.0.1/8                       u/u
                 ::1/128
vyos@vyos:~$
```

메모:

- https://wiki.vyos.net/wiki/User_Guide

2. vRouter

❖ VyOS 컨피규레이션 세팅

```
① configure
② set interfaces ethernet eth0 address dhcp     # Internet
③ set interfaces ethernet eth0 description ‘WAN’
④ set interfaces ethernet eth1 address ‘192.168.0.1/24’
⑤ set interfaces ethernet eth1 description ‘LAN’
⑥ set nat source rule 100 outbound-interface 'eth0'  # NAT
⑦ set nat source rule 100 source address '192.168.0.0/24'
⑧ set nat source rule 100 translation address masquerade
⑨ set service dhcp-server disabled 'false'      # DHCP Server
⑩ set service dhcp-server shared-network-name LAN subnet 192.168.0.0/24 default-router '192.168.0.1'
⑪ set service dhcp-server shared-network-name LAN subnet 192.168.0.0/24 dns-server '192.168.0.1'
⑫ set service dhcp-server shared-network-name LAN subnet 192.168.0.0/24 domain-name 'internal-network'
⑬ set service dhcp-server shared-network-name LAN subnet 192.168.0.0/24 lease '86400'
⑭ set service dhcp-server shared-network-name LAN subnet 192.168.0.0/24 start '192.168.0.200' stop '192.168.0.232'
⑮ set service dns forwarding cache-size '0'      # DNS
⑯ set service dns forwarding listen-on 'eth1'
⑰ set service dns forwarding name-server '8.8.8.8'
⑱ # commit → save → exit 후에 실행
```

메모:

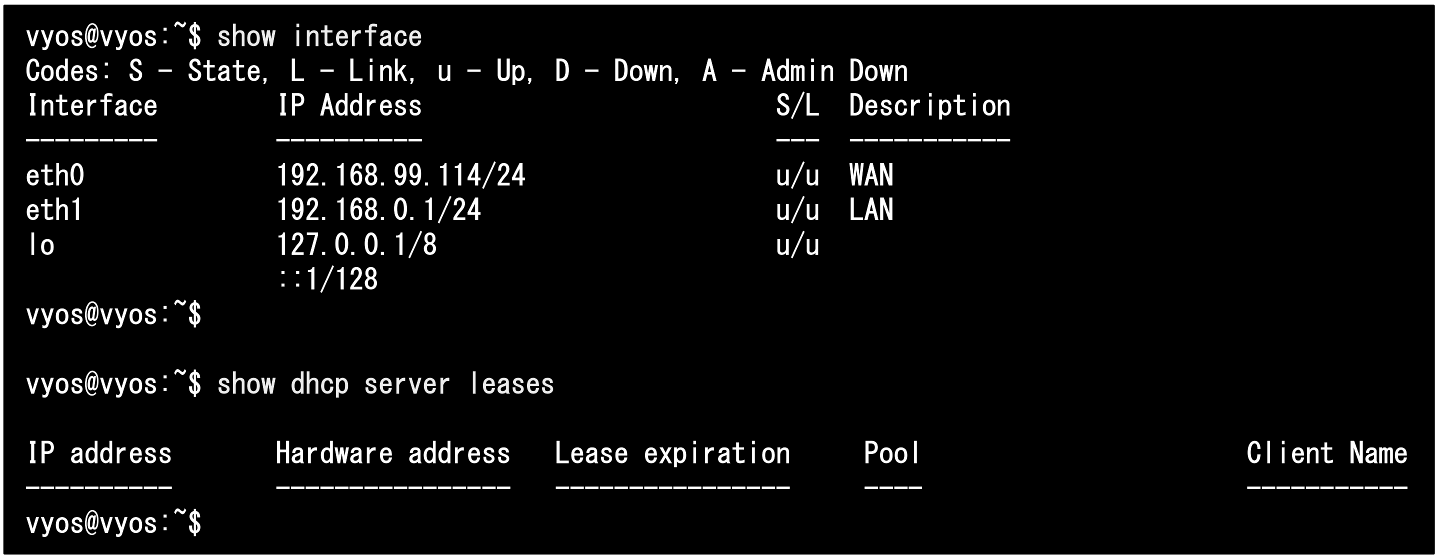
- 라우터 이름(예): set system host-name ‘vyos-1’
- 인터페이스 확인: ‘show interface’
- 컨피규레이션 완료: ‘commit’ & ‘save’
- DHCP IP주소 할당 확인: show dhcp server leases
- 업무 적용시: 고정 IP 주소 사용 권장

2. vRouter

❖ VyOS Operation

① show dhcp server leases　　# commit → save → exit
후에 실행

② show interface



```
vyos@vyos:~$ show interface
Codes: S - State, L - Link, u - Up, D - Down, A - Admin Down
Interface        IP Address                        S/L  Description
---------        ----------                        ---  -----------
eth0             192.168.99.114/24                 u/u  WAN
eth1             192.168.0.1/24                    u/u  LAN
lo               127.0.0.1/8                       u/u
                 ::1/128
vyos@vyos:~$

vyos@vyos:~$ show dhcp server leases

IP address       Hardware address   Lease expiration    Pool                       Client Name
----------       ----------------   ----------------    ----                       -----------
vyos@vyos:~$
```

메모:

- 실습용 호스트를 위한 DHCP 서버 설정
- VMware 이미지 사용 가능 (예: vyos-1.1.8-amd64.ova)

❖ VyOS 세팅 후 컨피규레이션 확인

```
vyos@vyos:~$ show config
interfaces {
  ethernet eth0 {
    address dhcp
    description WAN
    duplex auto
    hw-id 00:0c:29:fd:c9:ca
    smp_affinity auto
    speed auto
  }
  ethernet eth1 {
    address 192.168.0.1/24
    description LAN
    duplex auto
    hw-id 00:0c:29:fd:c9:d4
    smp_affinity auto
    speed auto
  }
  loopback lo {
  }
}
nat {
  source {
    rule 100 {
      outbound-interface eth0
      source {
        address
192.168.0.0/24
      }
      translation {
        address masquerade
      }
    }
  }
 }
service {
  dhcp-server {
    disabled false
    shared-network-name LAN {
      authoritative disable
      subnet 192.168.0.0/24 {
        default-router 192.168.0.1
        dns-server 192.168.0.1
        domain-name internal-network
        lease 86400
        start 192.168.0.200 {
          stop 192.168.0.232
        }
      }
    }
  }
  dns {
    forwarding {
      cache-size 0
      listen-on eth1
      name-server 8.8.8.8
    }
  }
  ssh {
    port 22
  }
}
system {
  config-management {
 commit-revisions 100
  }
  console {
  }
  host-name vyos
  login {
    user vyos {
      authentication {
        encrypted-password ****************
        plaintext-password ****************
      }
      level admin
    }
  }
ntp {
    server 0.pool.ntp.org {
    }
    server 1.pool.ntp.org {
    }
    server 2.pool.ntp.org {
    }
  }
  package {
    auto-sync 1
    repository community {
      components main
      distribution helium
      password ****************
      url http://packages.vyos.net/vyos
      username ""
    }
  }
  syslog {
    global {
      facility all {
        level notice
      }
      facility protocols {
        level debug
      }
    }
  }
  time-zone UTC
}
```

메모:

- LAN/WAN설정
- DHCP 서버 설정
- VMware 이미지 사용 가능

1. **Hypervisor**
2. **vRouter**
3. **Host 설치**
    - **CentOS 7**
    - **Ubuntu 16.04**
    - **QNX**

❖ **부록: VMware Lab 운영**

- **WorkStation**
- **KVM/QEMU**
- **vCenter Converter Standalone**

3. Host 설치 (Linux)

❖ Host 설치 환경

① **ISO 파일 사용**

- CentOS7 minimal
- Ubuntu Desktop 16.04
- Ubuntu Server 16.04

② **스토리지에 ISO 파일 Upload 필요**

③ **QNX와 Ubuntu Desktop 16.04의 VMware VM Image 는 vCenter Converter Standalone 이용**

클러스터링 별 계획(예)

VM Name	Host Name	IP Address	Interface Name	
Master	master	192.168.1.10	ens192	
Worker01	worker01	192.168.1.11	ens192	
Worker02	worker02	192.168.1.12	ens192	
Worker03	worker03	192.168.1.13	ens192	

메모:

- Type 2 하이퍼바이저에서 VM 설치방법 1: 우분투(Ubuntu Server/Desktop) OVA
- Type 2 하이퍼바이저에서 VM 설치방법 2: 우분투(Ubuntu Server/Desktop) ISO
- VMware vCenter Converter Standalone 사용하여 배포
- 루트계정 활성화: sudo passwd root

3. Host 설치 (Linux)

❖ Host 설치 환경

❖ 폐쇄망 허용 보안정책 Opensource Software:

- ✓ **apt** (Ubuntu)
- ✓ **apt-get** (Ubuntu)
- ✓ **snap**
- ✓ **yum** (CentOS)
- ✓ **dnf** (CentOS)
- ✓ **Docker hub** (도커)
- ✓ **Helm** (쿠버네티스)

메모:

- 가상 호스트별 보안정책 저장 위치 (예)
  - ✓ nano /etc/apt/apt.conf
  - ✓ vi /etc/yum.conf

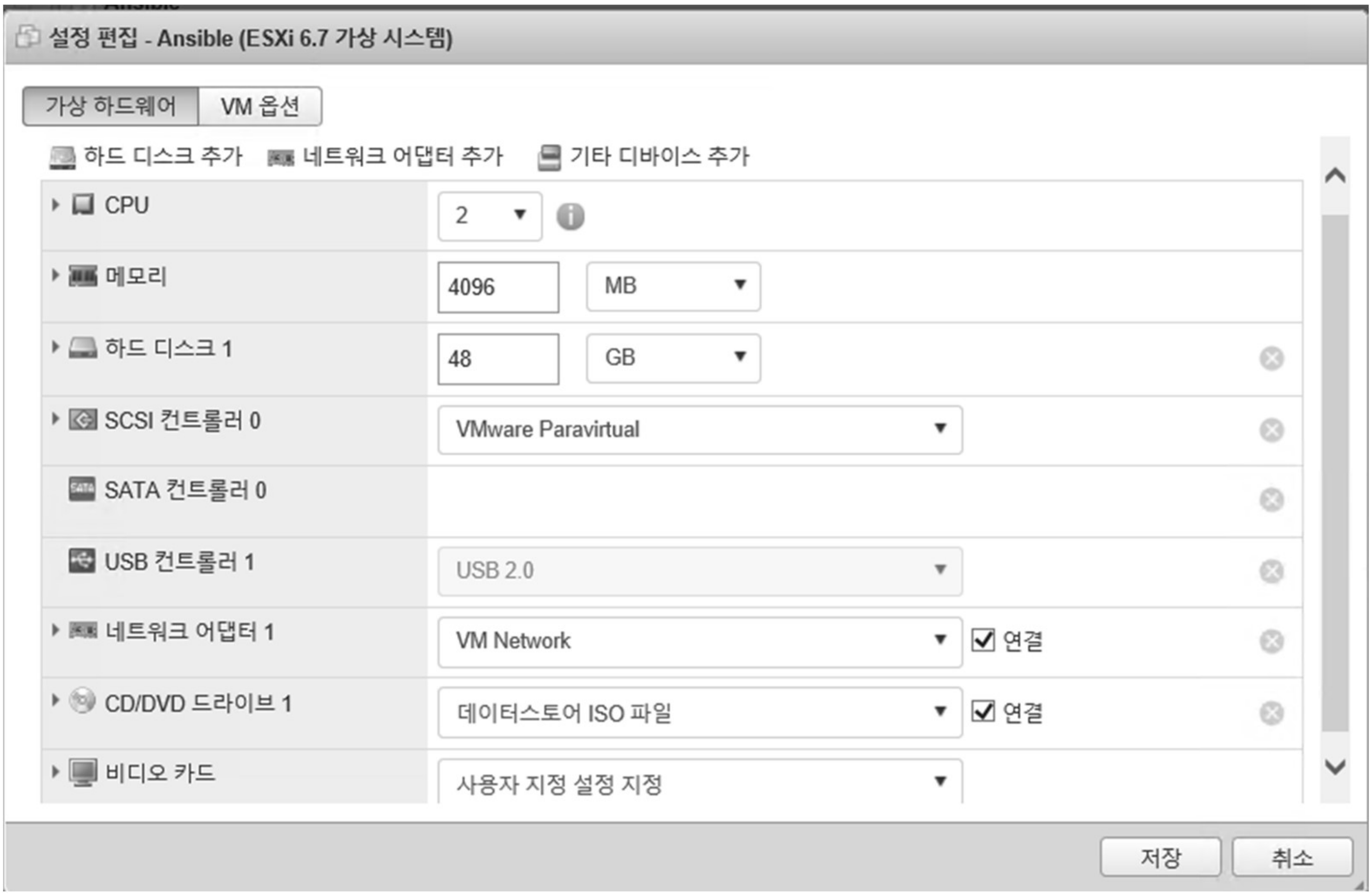
3. Host 설치 (CentOS 7)

❖ CentOS7 Installation

① **ESXi 6.7 사용**

② **vCPU 2개, vRAM 4GB, 48 GB Storage** (Thin)

③ **다운로드한 CentOS7 Minimal ISO 파일 사용 설치**



설정 편집 - Ansible (ESXi 6.7 가상 시스템)

CPU	2
메모리	4096 MB
하드 디스크 1	48 GB
SCSI 컨트롤러 0	VMware Paravirtual
SATA 컨트롤러 0	
USB 컨트롤러 1	USB 2.0
네트워크 어댑터 1	VM Network ☑ 연결
CD/DVD 드라이브 1	데이터스토어 ISO 파일 ☑ 연결
비디오 카드	사용자 지정 설정 지정

메모:

- 다운로드 주소: https://www.centos.org/download/
- 사용 ISO 파일 위치: http://ftp.kaist.ac.kr/CentOS/7.5.1804/isos/x86_64/CentOS-7-x86_64-Minimal-1804.iso

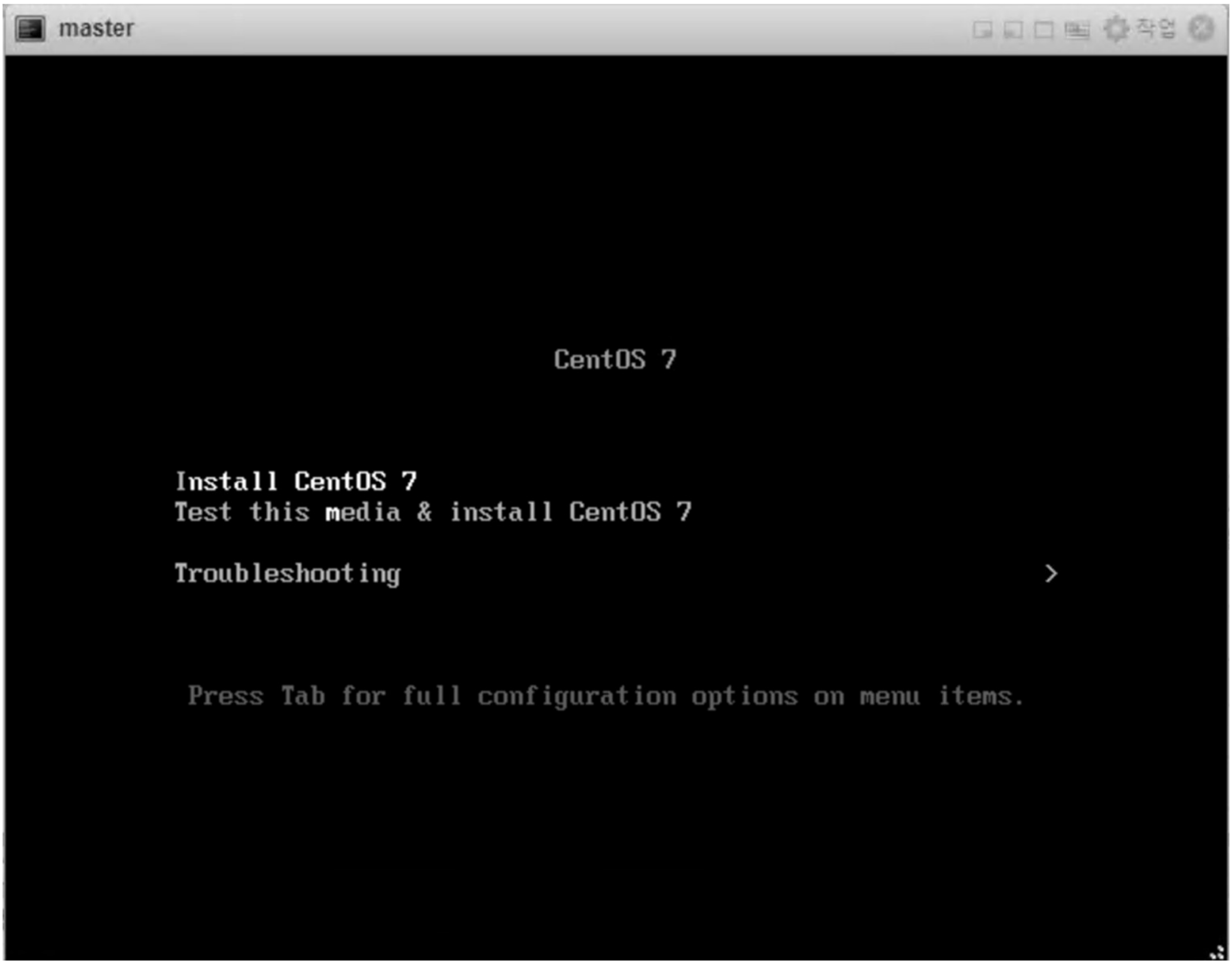
3. Host 설치 (CentOS 7)

❖ CentOS7 Installation @ vSphere

① **VM 전원 켜기**

② **Install CentOS 7**

③ **설치시 필요한 환경 설정**



```
CentOS 7

Install CentOS 7
Test this media & install CentOS 7

Troubleshooting                                    >

Press Tab for full configuration options on menu items.
```

메모:

- 다운로드 주소: https://www.centos.org/download/
- 사용 ISO 파일 위치: http://ftp.kaist.ac.kr/CentOS/7.5.1804/isos/x86_64/CentOS-7-x86_64-Minimal-1804.iso
- 계정 (예) : root/ password

3. Host 설치 (CentOS 7)

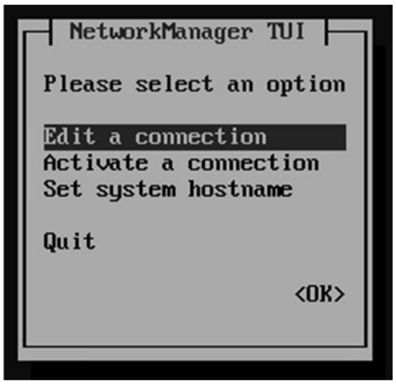
❖ CentOS7 네트워크 설정

① **nmtui** # IP 주소 설정 192.168.1.10 (Tab 키 사용 이동)

② **ip add** # 설정한 IP 주소 확인 @ Terminal

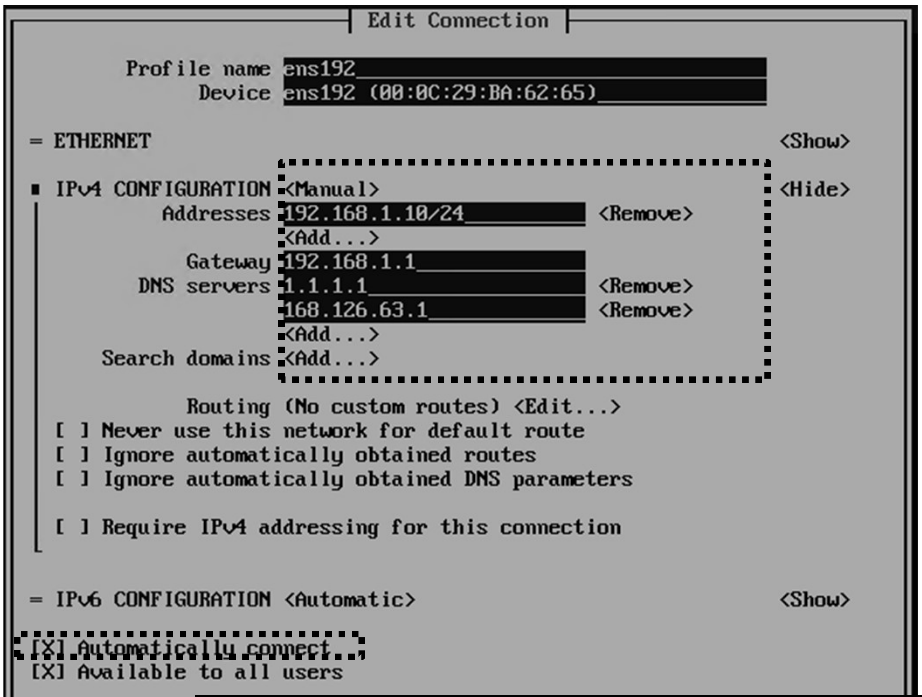
③ **echo “nameserver 1.1.1.1”>> /etc/resolv.conf** # 선택

④ **vi /etc/resolv.conf** # dns 주소 1.1.1.1 추가 확인



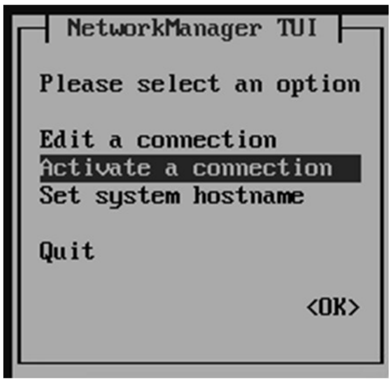
```
NetworkManager TUI

Please select an option

Edit a connection
Activate a connection
Set system hostname

Quit

                         <OK>
```

nmtui 명령어 수행 화면



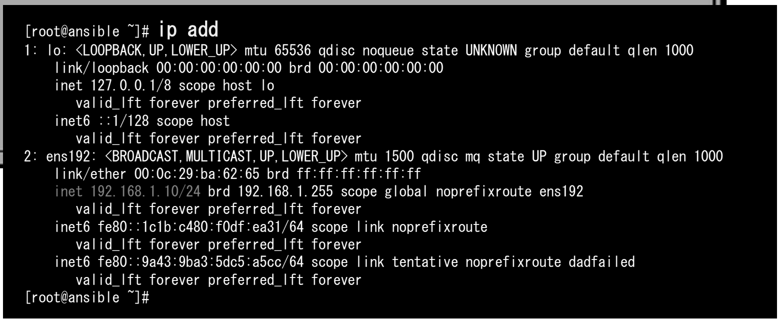
```
                        Edit Connection

        Profile name ens192
              Device ens192 (00:0C:29:BA:62:65)

= ETHERNET                                                 <Show>

■ IPv4 CONFIGURATION <Manual>                              <Hide>
           Addresses 192.168.1.10/24          <Remove>
                     <Add...>
             Gateway 192.168.1.1
         DNS servers 1.1.1.1                  <Remove>
                     168.126.63.1             <Remove>
                     <Add...>
      Search domains <Add...>

             Routing (No custom routes) <Edit...>
  [ ] Never use this network for default route
  [ ] Ignore automatically obtained routes
  [ ] Ignore automatically obtained DNS parameters

  [ ] Require IPv4 addressing for this connection

= IPv6 CONFIGURATION <Automatic>                           <Show>

[X] Automatically connect
[X] Available to all users
```

IP 주소 설정



```
NetworkManager TUI

Please select an option

Edit a connection
Activate a connection
Set system hostname

Quit

                         <OK>
```

Activate a connection



```
[root@ansible ~]# ip add
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: ens192: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:0c:29:ba:62:65 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.10/24 brd 192.168.1.255 scope global noprefixroute ens192
       valid_lft forever preferred_lft forever
    inet6 fe80::1c1b:c480:f0df:ea31/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
    inet6 fe80::9a43:9ba3:5dc5:a5cc/64 scope link tentative noprefixroute dadfailed
       valid_lft forever preferred_lft forever
[root@ansible ~]#
```

메모:

- 접속 후 계정 사용하여 로그인 계정 (예) : root/ password

3. Host 설치 (CentOS 7)

❖ Cloning CentOS7

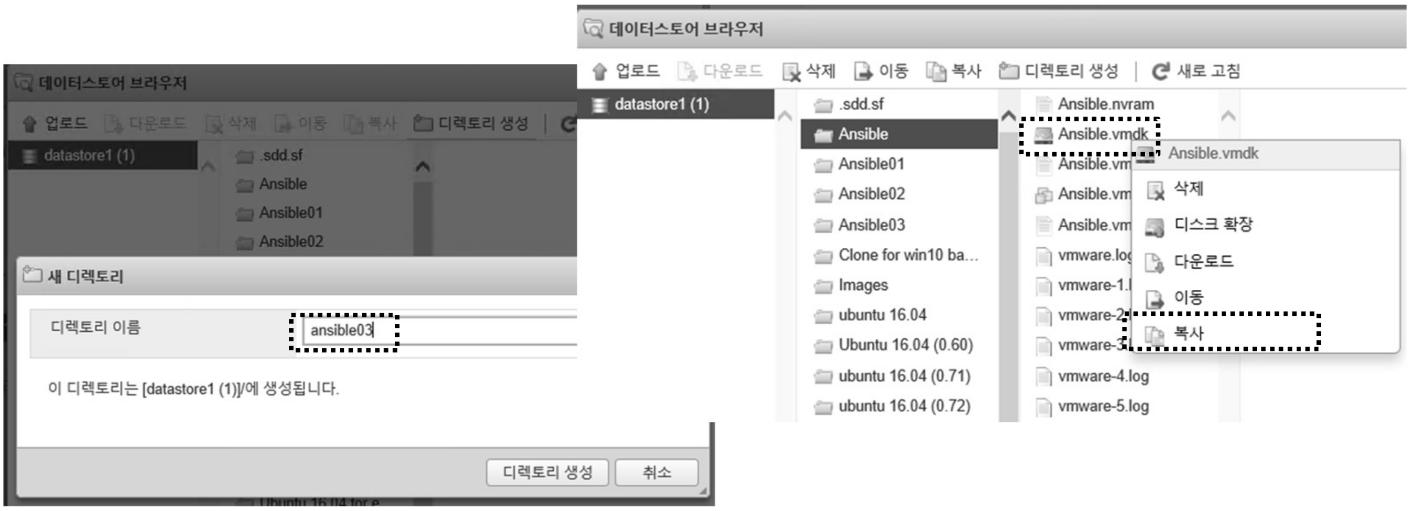
① **hostnamectl set-hostname master**   # @ master

② **su -**

③ **poweroff**   **# master**

④ **복제를 위해 데이터스토어에서 디렉토리 생성 (3개)**

⑤ **master.vmdk / master.vmx 파일 선택후 디렉토리에 복제**



디렉토리 이름: ansible03

이 디렉토리는 [datastore1 (1)]/에 생성됩니다.

VM Name	Host Name	IP Address	Interface Name	
Master	master	192.168.1.10	ens192	
Worker01	worker01	192.168.1.11	ens192	
Worker02	worker02	192.168.1.12	ens192	
Worker03	worker03	192.168.1.13	ens192	

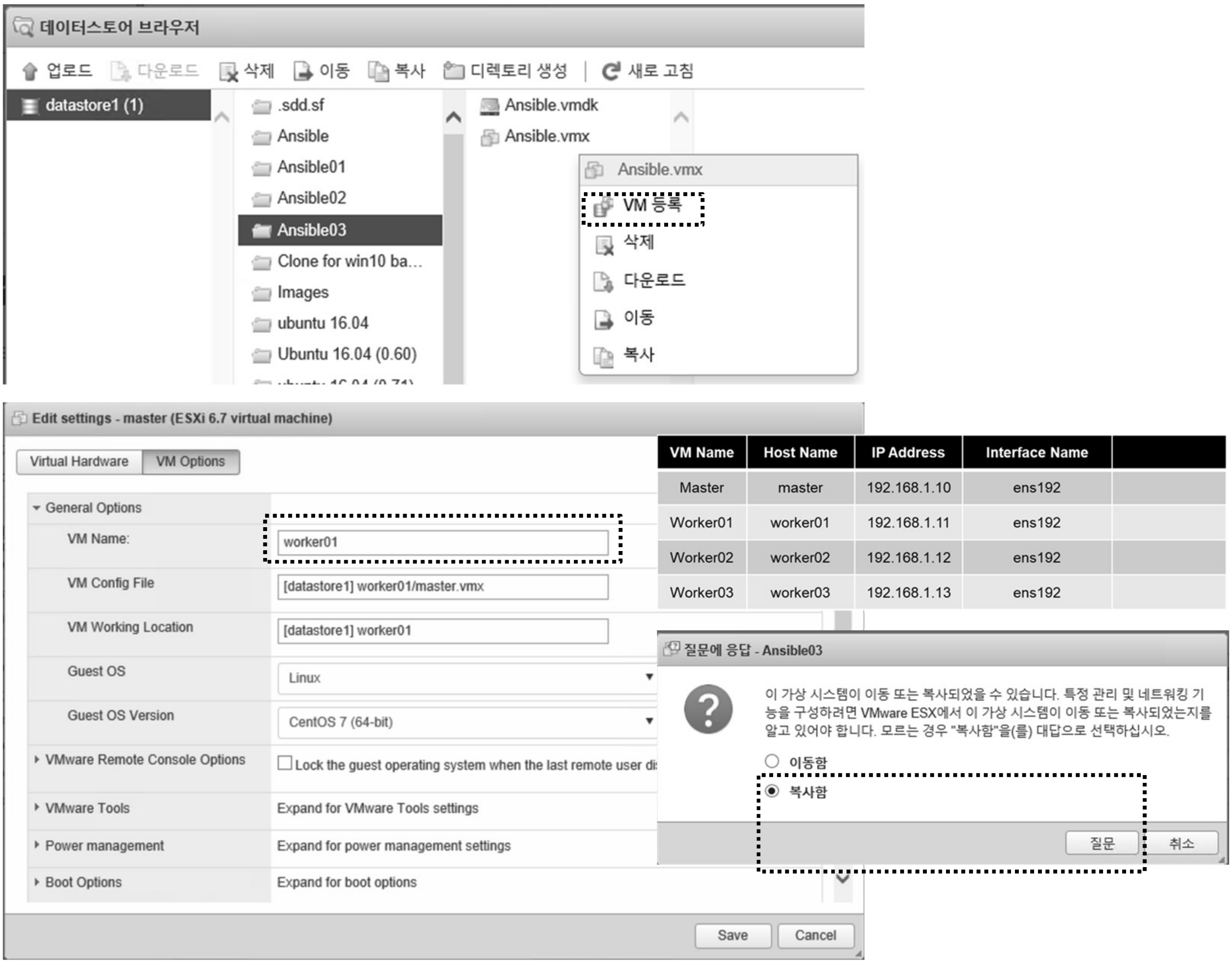
메모:

- VMware vCenter Converter Standalone 사용 가능
- 다운로드 주소: https://www.centos.org/download/
- 사용 ISO 파일 위치: http://ftp.kaist.ac.kr/CentOS/7.5.1804/isos/x86_64/CentOS-7-x86_64-Minimal-1804.iso

3. Host 설치 (CentOS 7)

❖ Cloning CentOS7

① VM 등록 (3개)
② 등록 VM 확인후 이름 변경
③ 복제 VM 실행 시 '복사함' 확인 (질문?)



Edit settings - master (ESXi 6.7 virtual machine)

Virtual Hardware | VM Options

▾ General Options
- VM Name: worker01
- VM Config File: [datastore1] worker01/master.vmx
- VM Working Location: [datastore1] worker01
- Guest OS: Linux
- Guest OS Version: CentOS 7 (64-bit)

▸ VMware Remote Console Options: □ Lock the guest operating system when the last remote user di

▸ VMware Tools: Expand for VMware Tools settings

▸ Power management: Expand for power management settings

▸ Boot Options: Expand for boot options

Save | Cancel

VM Name	Host Name	IP Address	Interface Name	
Master	master	192.168.1.10	ens192	
Worker01	worker01	192.168.1.11	ens192	
Worker02	worker02	192.168.1.12	ens192	
Worker03	worker03	192.168.1.13	ens192	

질문에 응답 - Ansible03

이 가상 시스템이 이동 또는 복사되었을 수 있습니다. 특정 관리 및 네트워킹 기능을 구성하려면 VMware ESX에서 이 가상 시스템이 이동 또는 복사되었는지를 알고 있어야 합니다. 모르는 경우 "복사함"을(를) 대답으로 선택하십시오.

○ 이동함

● 복사함

질문 | 취소

메모:

- 다운로드 주소: https://www.centos.org/download/
- 사용 ISO 파일 위치: http://ftp.kaist.ac.kr/CentOS/7.5.1804/isos/x86_64/CentOS-7-x86_64-Minimal-1804.iso

3. Host 설치 (CentOS 7)

❖ Cloning CentOS7

① **hostnamectl set-hostname master** # @ master

② **hostnamectl set-hostname worker01** # @ worker01

③ **hostnamectl set-hostname worker02** # @ worker02

④ **hostnamectl set-hostname worker03** # @ worker03

⑤ **su -** # 각 호스트에서 확인

⑥ **nmtui** # IP 주소 설정 192.168.1.1x (Tab 키 사용 이동)

⑦ **IP 주소 변경 후 Deactivate - Activate a Connection**

⑧ **ip add** # 설정한 IP 주소 확인 @ Terminal

⑨ **echo “nameserver 1.1.1.1”>> /etc/resolv.conf**

⑩ **cvi /etc/resolv.conf** # dns 주소 1.1.1.1 추가 확인

시험 서버 클러스터 구성 표(예)

VM Name	Host Name	IP Address	Interface Name	
Ansible	ansible	192.168.1.10	ens192	
Ansuile01	ansible01	192.168.1.11	ens192	
Ansible02	ansible02	192.168.1.12	ens192	
Ansible03	ansible03	192.168.1.13	ens192	

메모:

- 다운로드 주소: https://www.centos.org/download/
- 사용 ISO 파일 위치: http://ftp.kaist.ac.kr/CentOS/7.5.1804/isos/x86_64/CentOS-7-x86_64-Minimal-1804.iso
- SuperPutty 사용 가능

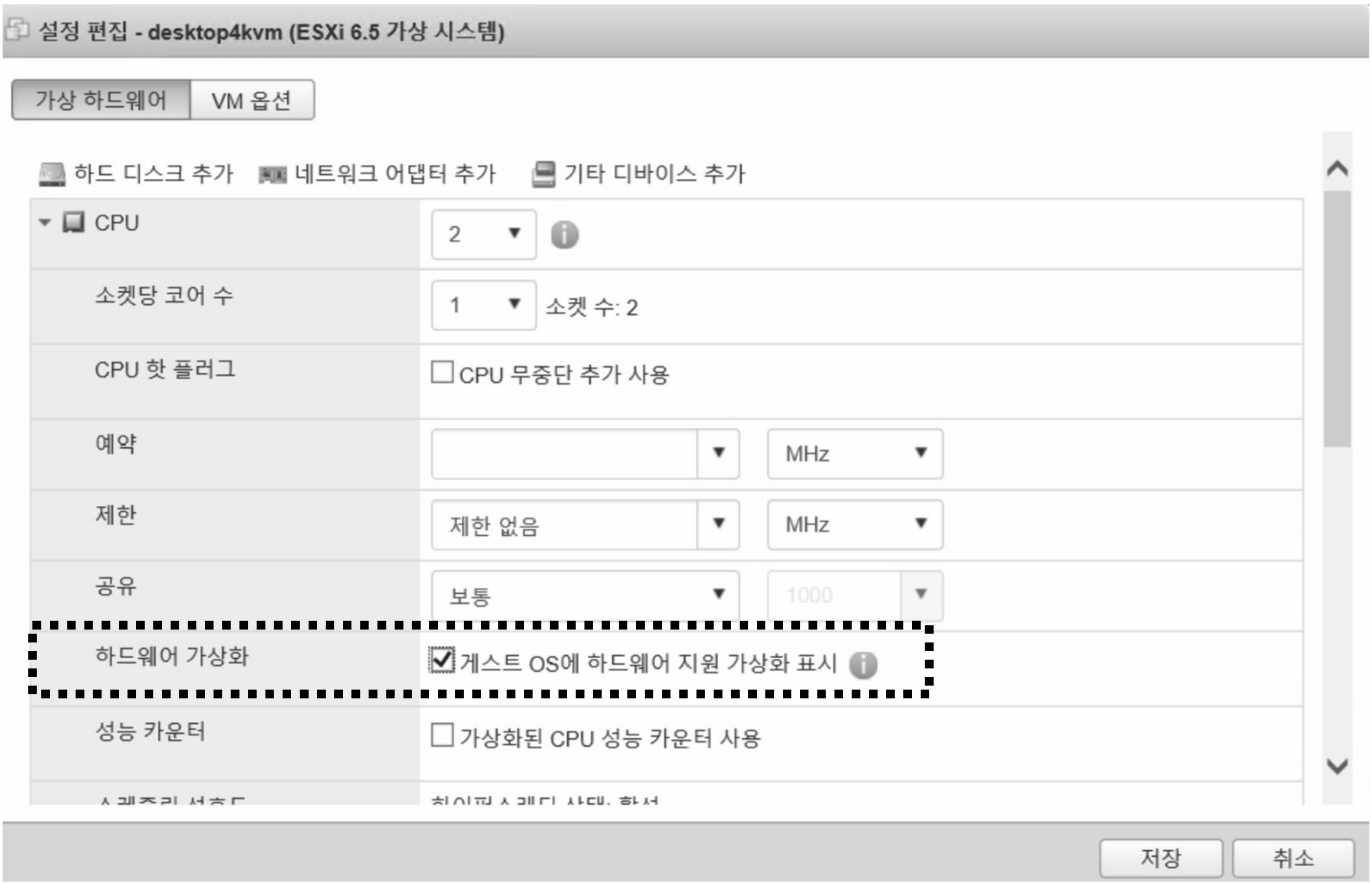
3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation

① **ESXi 6.7 사용**

② **vCPU**

③ **KVM을 위한 하드웨어 가상화 설정 확인**



설정 편집 - desktop4kvm (ESXi 6.5 가상 시스템)

CPU	2
소켓당 코어 수	1 소켓 수: 2
CPU 핫 플러그	□ CPU 무중단 추가 사용
예약	MHz
제한	제한 없음 MHz
공유	보통 1000
하드웨어 가상화	☑ 게스트 OS에 하드웨어 지원 가상화 표시
성능 카운터	□ 가상화된 CPU 성능 카운터 사용
스케줄링 선호도	하이퍼스레딩 상태: 활성

메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

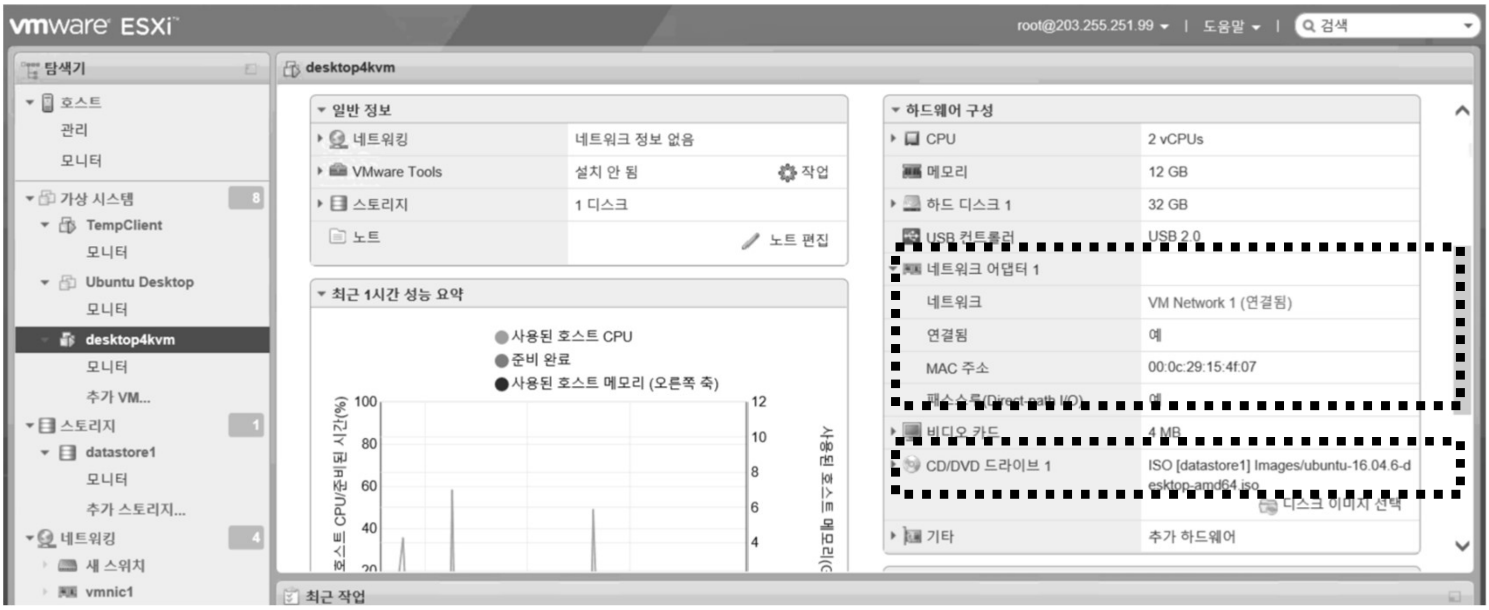
3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation

① 네트워크 어댑터 설정 확장

② SR-IOV를 사용하는 패스스루(Direct-pass I/O) 설정 확인

③ 스토리지에 ISO 파일 업로드 후에 CD/DVD 드라이브 에서 등록 가능



일반 정보

네트워킹	네트워크 정보 없음
VMware Tools	설치 안 됨 작업
스토리지	1 디스크
노트	노트 편집

하드웨어 구성

CPU	2 vCPUs
메모리	12 GB
하드 디스크 1	32 GB
USB 컨트롤러	USB 2.0
네트워크 어댑터 1	
네트워크	VM Network 1 (연결됨)
연결됨	예
MAC 주소	00:0c:29:15:4f:07
패스스루(Direct-path I/O)	예
비디오 카드	4 MB
CD/DVD 드라이브 1	ISO [datastore1] Images/ubuntu-16.04.6-desktop-amd64.iso 디스크 이미지 선택
기타	추가 하드웨어

메모:

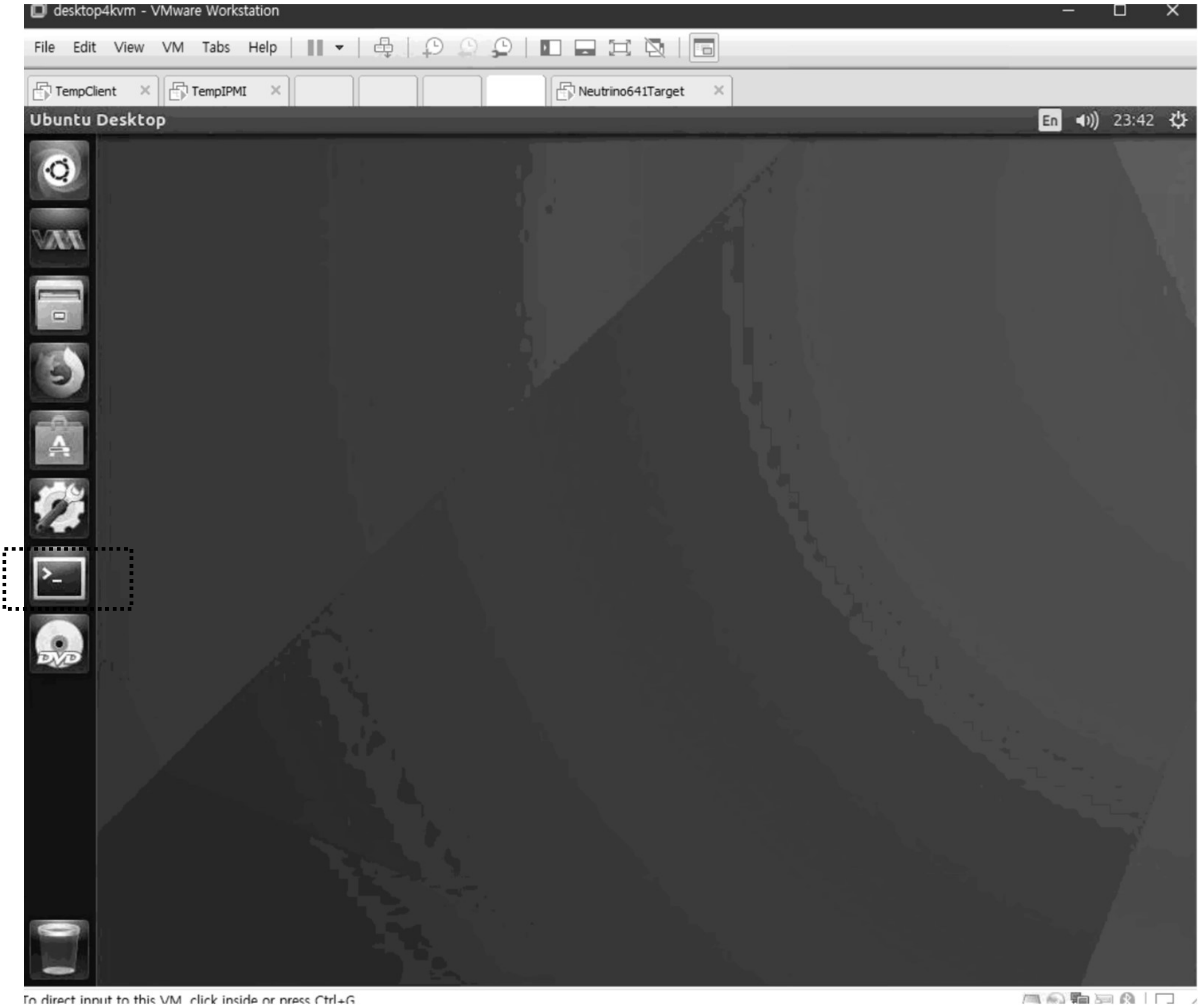
- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation

① **VM 시작/설치**

② **설치 후 터미널 실행** (설치 History 확인)



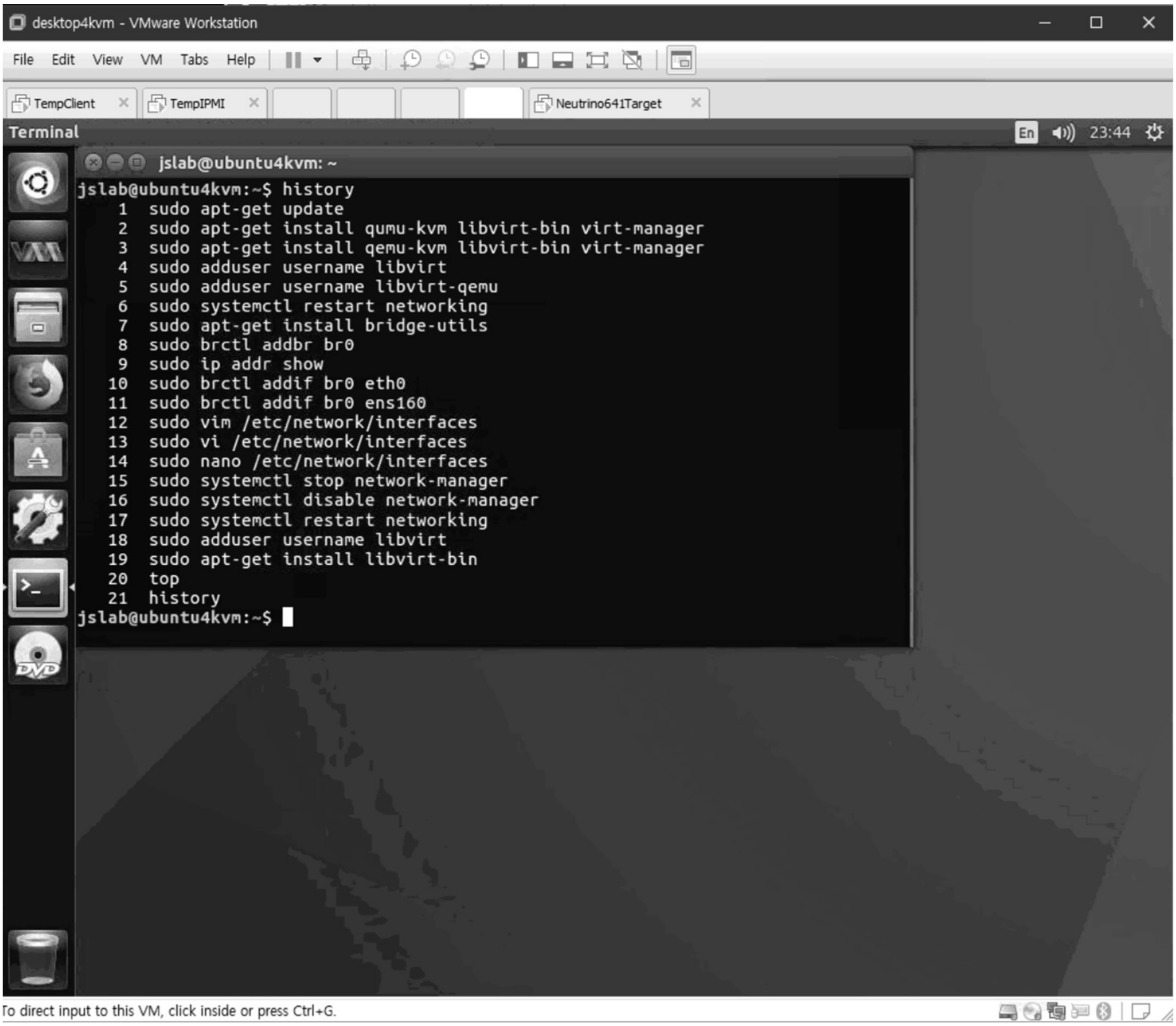
desktop4kvm - VMware Workstation
File Edit View VM Tabs Help
TempClient
TempIPMI
Neutrino641Target
Ubuntu Desktop
En
23:42
To direct input to this VM, click inside or press Ctrl+G.

메모:

3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation

① History 확인 (폐쇄 환경 시 필요 기능 미리 설치 후 사용)
② 설치 후 실행한 명령어 확인 'history'


desktop4kvm - VMware Workstation
File Edit View VM Tabs Help
TempClient
TempIPMI
Neutrino641Target
Terminal
En
23:44
jslab@ubuntu4kvm: ~
To direct input to this VM, click inside or press Ctrl+G.

```
jslab@ubuntu4kvm:~$ history
    1  sudo apt-get update
    2  sudo apt-get install qumu-kvm libvirt-bin virt-manager
    3  sudo apt-get install qemu-kvm libvirt-bin virt-manager
    4  sudo adduser username libvirt
    5  sudo adduser username libvirt-qemu
    6  sudo systemctl restart networking
    7  sudo apt-get install bridge-utils
    8  sudo brctl addbr br0
    9  sudo ip addr show
   10  sudo brctl addif br0 eth0
   11  sudo brctl addif br0 ens160
   12  sudo vim /etc/network/interfaces
   13  sudo vi /etc/network/interfaces
   14  sudo nano /etc/network/interfaces
   15  sudo systemctl stop network-manager
   16  sudo systemctl disable network-manager
   17  sudo systemctl restart networking
   18  sudo adduser username libvirt
   19  sudo apt-get install libvirt-bin
   20  top
   21  history
jslab@ubuntu4kvm:~$ 
```

메모:

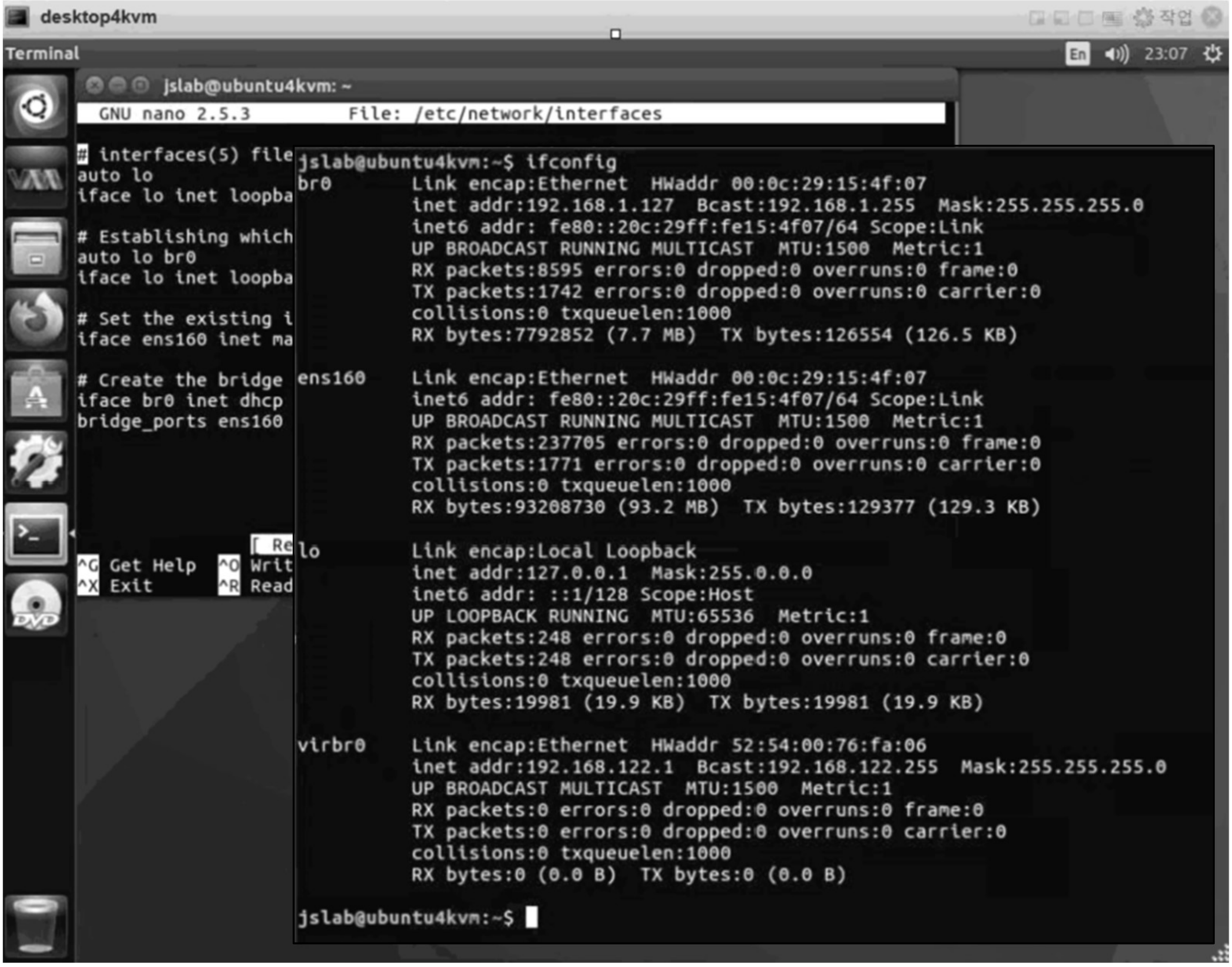
- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

3. Host 설치 (Ubuntu)

❖ interfaces

① **nano /etc/network/interfaces**

② **Check Interface ‘ens160’**



```
  GNU nano 2.5.3          File: /etc/network/interfaces

# interfaces(5) file
auto lo
iface lo inet loopba

# Establishing which
auto lo br0
iface lo inet loopba

# Set the existing i
iface ens160 inet ma

# Create the bridge
iface br0 inet dhcp
bridge_ports ens160

                 [ Re
^G Get Help    ^O Writ
^X Exit        ^R Read
```

```
jslab@ubuntu4kvm:~$ ifconfig
br0       Link encap:Ethernet  HWaddr 00:0c:29:15:4f:07
          inet addr:192.168.1.127  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe15:4f07/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:8595 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1742 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:7792852 (7.7 MB)  TX bytes:126554 (126.5 KB)

ens160    Link encap:Ethernet  HWaddr 00:0c:29:15:4f:07
          inet6 addr: fe80::20c:29ff:fe15:4f07/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:237705 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1771 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:93208730 (93.2 MB)  TX bytes:129377 (129.3 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:248 errors:0 dropped:0 overruns:0 frame:0
          TX packets:248 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:19981 (19.9 KB)  TX bytes:19981 (19.9 KB)

virbr0    Link encap:Ethernet  HWaddr 52:54:00:76:fa:06
          inet addr:192.168.122.1  Bcast:192.168.122.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

jslab@ubuntu4kvm:~$ █
```

메모:

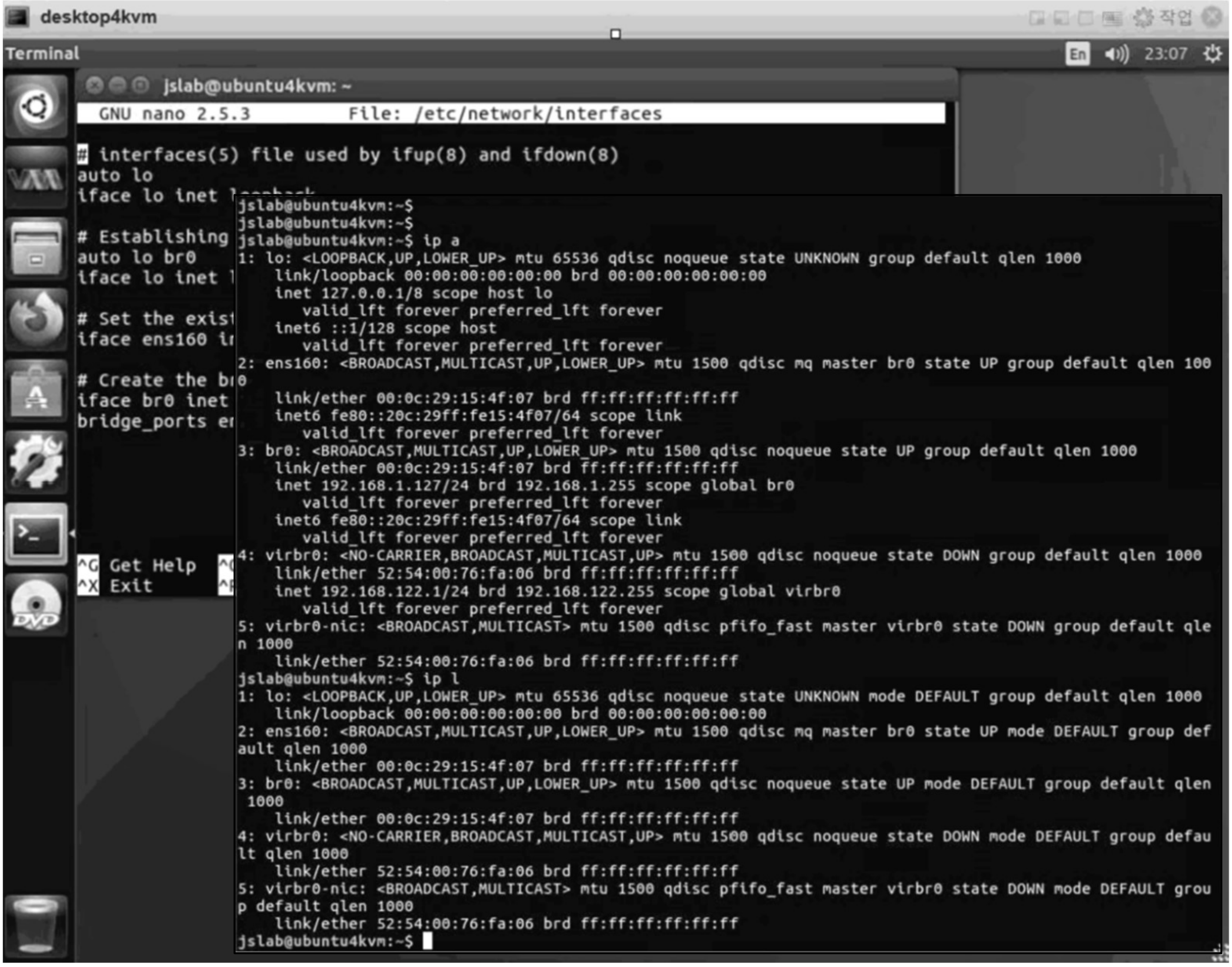
- DHCP 서버가 없는 환경은 Interface 특성 변경 시 VM 이미지 내의 Interface ens160 대신 새로운 인터페이스 ‘ens33’등이 생성하며 리눅스 명령어 **ip a** 또는 **ip l** 또는 **ip link show**등으로 확인하여 새로 생성된 Interface에 고정 IP를 설정해야 함.

3. Host 설치 (Ubuntu)

❖ interfaces

① **nano /etc/network/interfaces**

② **Check Interface ‘ensxxx’**



```
  GNU nano 2.5.3          File: /etc/network/interfaces

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
iface lo inet l

# Establishing
auto lo br0
iface lo inet l

# Set the exist
iface ens160 in

# Create the br
iface br0 inet
bridge_ports en

^G Get Help  ^
^X Exit      ^
```

```
jslab@ubuntu4kvm:~$
jslab@ubuntu4kvm:~$
jslab@ubuntu4kvm:~$ ip a
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: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq master br0 state UP group default qlen 100
0
    link/ether 00:0c:29:15:4f:07 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::20c:29ff:fe15:4f07/64 scope link
       valid_lft forever preferred_lft forever
3: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 00:0c:29:15:4f:07 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.127/24 brd 192.168.1.255 scope global br0
       valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fe15:4f07/64 scope link
       valid_lft forever preferred_lft forever
4: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
    link/ether 52:54:00:76:fa:06 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
       valid_lft forever preferred_lft forever
5: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc pfifo_fast master virbr0 state DOWN group default qle
n 1000
    link/ether 52:54:00:76:fa:06 brd ff:ff:ff:ff:ff:ff
jslab@ubuntu4kvm:~$ ip l
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq master br0 state UP mode DEFAULT group def
ault qlen 1000
    link/ether 00:0c:29:15:4f:07 brd ff:ff:ff:ff:ff:ff
3: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen
 1000
    link/ether 00:0c:29:15:4f:07 brd ff:ff:ff:ff:ff:ff
4: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group defau
lt qlen 1000
    link/ether 52:54:00:76:fa:06 brd ff:ff:ff:ff:ff:ff
5: virbr0-nic: <BROADCAST,MULTICAST> mtu 1500 qdisc pfifo_fast master virbr0 state DOWN mode DEFAULT grou
p default qlen 1000
    link/ether 52:54:00:76:fa:06 brd ff:ff:ff:ff:ff:ff
jslab@ubuntu4kvm:~$
```

메모:

- 리눅스 명령어 **ip a** 또는 **ip l** 또는 **ip link show**등으로 확인하여 새로 생성된 Interface에 고정 IP를 설정해야 함.

❖ Ubuntu Desktop 16.04 Installation (Networking)

① **sudo apt-get install bridge-utils**

② **sudo brctl addbr br0**

③ **sudo ip addr show**

④ **sudo brctl addif br0 eth0**

⑤ **sudo vim /etc/network/interfaces**

```
### Establishing which interfaces to load at boot and establish the loopback
auto lo br0
iface lo inet loopback
### Set the existing interface to manual to keep it from interfering with the bridge via DHCP
iface eth0 inet manual
### Create the bridge and set it to DHCP.  Link it to the existing interface.
iface br0 inet dhcp
bridge_ports eth0
```

⑥ **sudo systemctl stop network-manager**

⑦ **sudo systemctl disable network-manager**

⑧ **sudo systemctl restart networking**

메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

3. Host 설치 (Ubuntu)

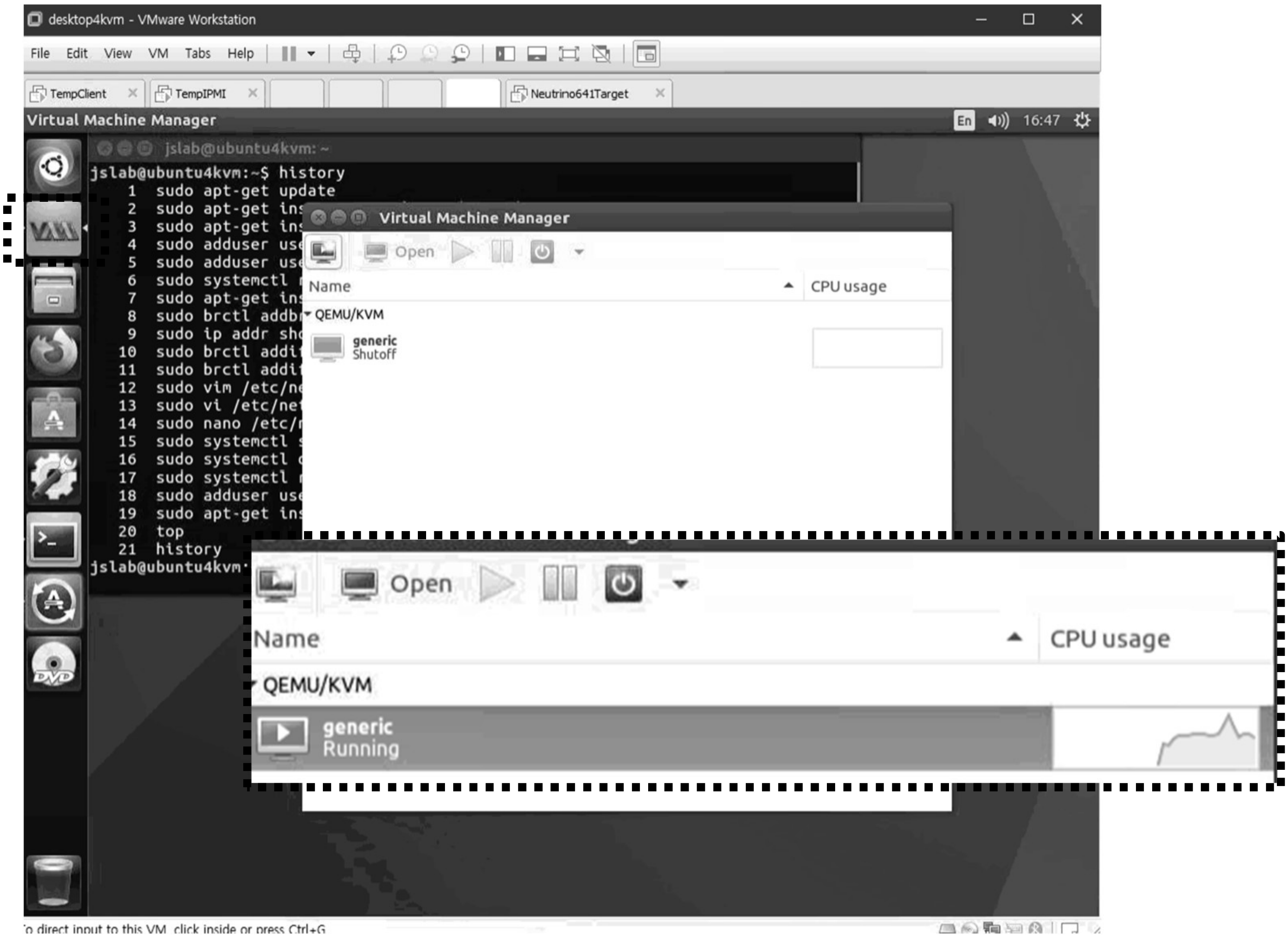
❖ Ubuntu Desktop 16.04 Installation (KVM)

① **sudo apt-get install qemu-kvm libvirt-bin virt-manager**

② **sudo adduser username libvirt**

③ **sudo adduser username libvirt-qemu**

④ **Start Virt-Manager** (as nested hypervisor)



```
jslab@ubuntu4kvm:~$ history
    1  sudo apt-get update
    2  sudo apt-get ins
    3  sudo apt-get ins
    4  sudo adduser use
    5  sudo adduser use
    6  sudo systemctl
    7  sudo apt-get ins
    8  sudo brctl addbr
    9  sudo ip addr sho
   10  sudo brctl addi
   11  sudo brctl addi
   12  sudo vim /etc/ne
   13  sudo vi /etc/net
   14  sudo nano /etc/
   15  sudo systemctl
   16  sudo systemctl
   17  sudo systemctl
   18  sudo adduser use
   19  sudo apt-get ins
   20  top
   21  history
jslab@ubuntu4kvm:
```

메모:

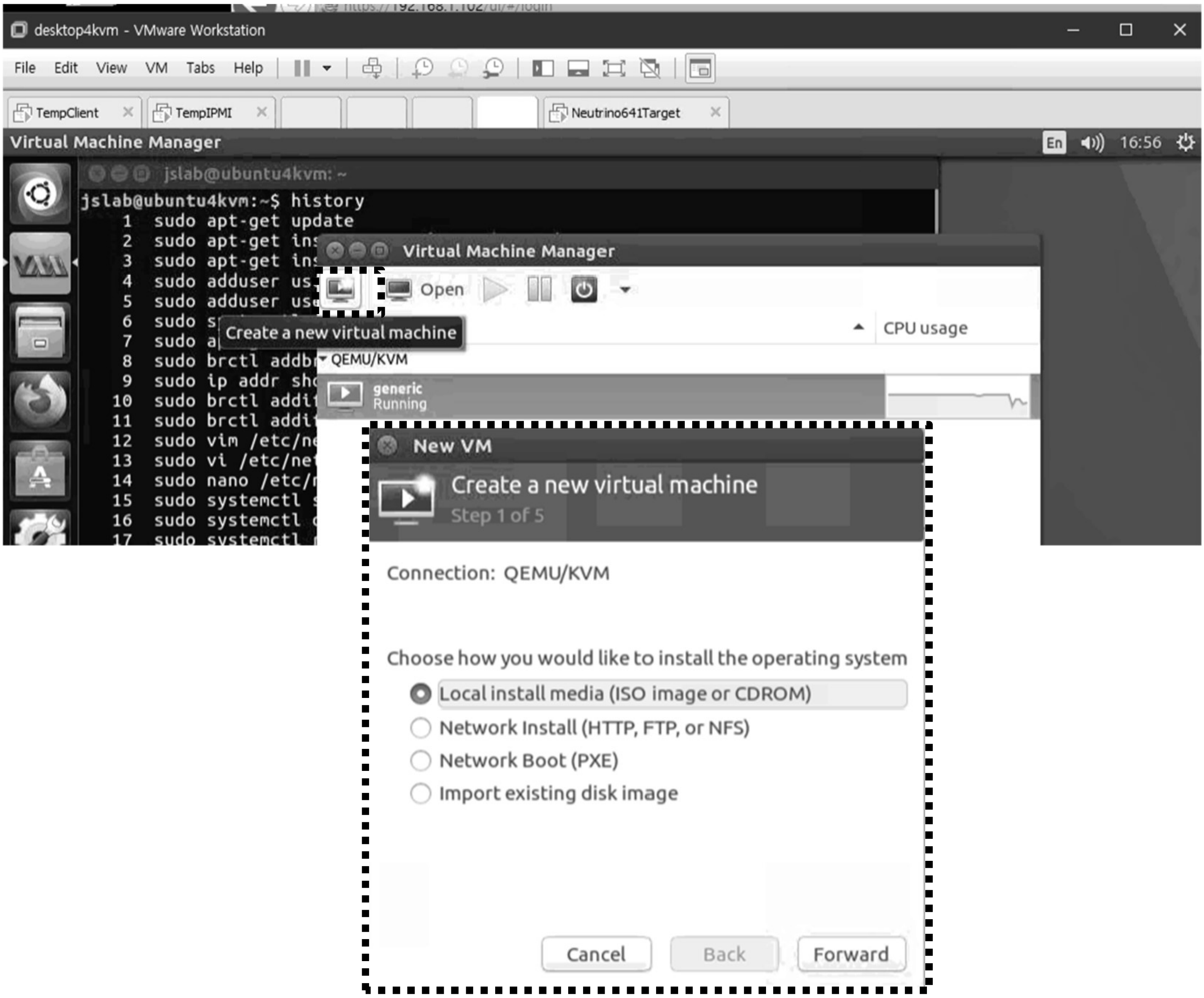
- Ubuntu에서 KVM 설치 후 하이퍼바이저 ESXi에서 하드웨어 가상화 미설정 확인 후에는 KVM 구동을 위해 **systemctl start libvirtd** 실행

3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation (Virt-Manager)

① **Create a new virtual machine**

② **Use ISO File (Ubuntu 설치 반복)**



```
jslab@ubuntu4kvm:~$ history
    1  sudo apt-get update
    2  sudo apt-get ins
    3  sudo apt-get ins
    4  sudo adduser us
    5  sudo adduser us
    6  sudo s
    7  sudo a
    8  sudo brctl addbr
    9  sudo ip addr sho
   10  sudo brctl addi
   11  sudo brctl addi
   12  sudo vim /etc/ne
   13  sudo vi /etc/ne
   14  sudo nano /etc/
   15  sudo systemctl
   16  sudo systemctl
   17  sudo systemctl
```

Create a new virtual machine
Step 1 of 5

Connection: QEMU/KVM

Choose how you would like to install the operating system

- ● Local install media (ISO image or CDROM)
- ○ Network Install (HTTP, FTP, or NFS)
- ○ Network Boot (PXE)
- ○ Import existing disk image

메모:

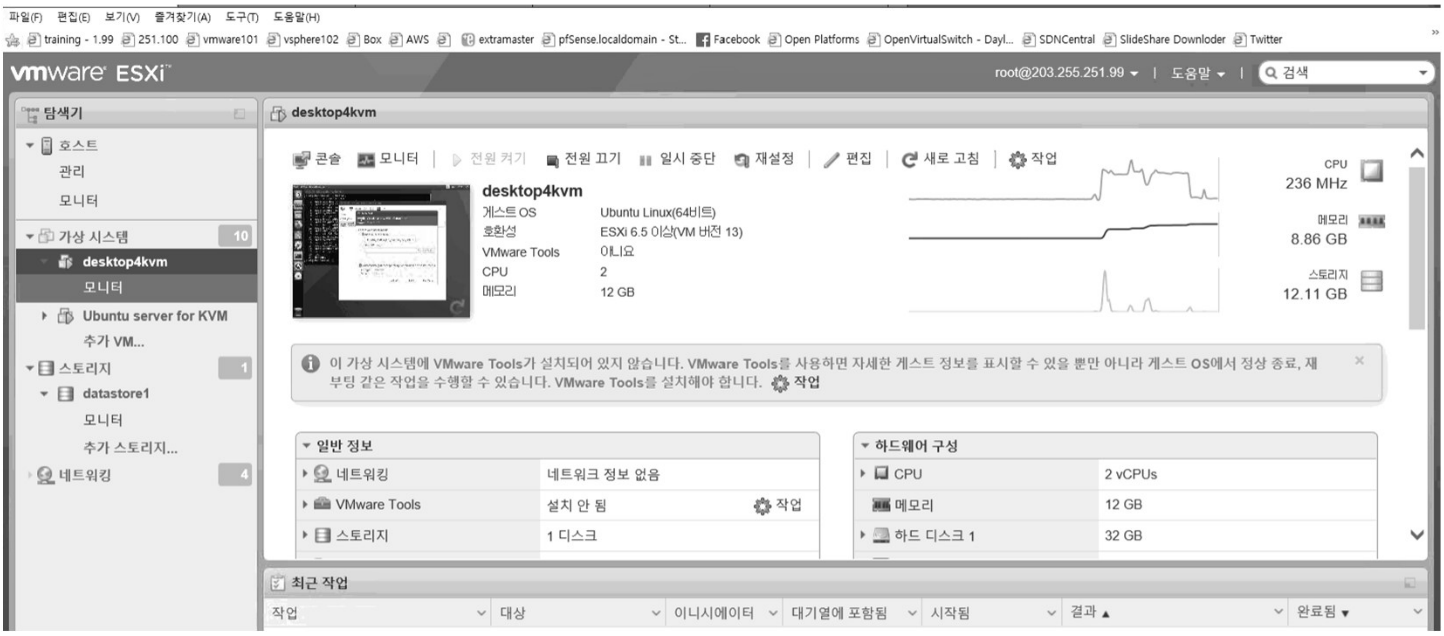
- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

3. Host 설치 (Ubuntu)

❖ Ubuntu Desktop 16.04 Installation (Virt-Manager)

① **Create a new virtual machine**

② **Use ISO File**



desktop4kvm

게스트 OS	Ubuntu Linux(64비트)
호환성	ESXi 6.5 이상(VM 버전 13)
VMware Tools	아니요
CPU	2
메모리	12 GB

이 가상 시스템에 VMware Tools가 설치되어 있지 않습니다. VMware Tools를 사용하면 자세한 게스트 정보를 표시할 수 있을 뿐만 아니라 게스트 OS에서 정상 종료, 재부팅 같은 작업을 수행할 수 있습니다. VMware Tools를 설치해야 합니다. 작업

일반 정보	
네트워킹	네트워크 정보 없음
VMware Tools	설치 안 됨 작업
스토리지	1 디스크

하드웨어 구성	
CPU	2 vCPUs
메모리	12 GB
하드 디스크 1	32 GB

최근 작업

작업	대상	이니시에이터	대기열에 포함됨	시작됨	결과 ▲	완료됨 ▼

메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

3. Host 설치 (Ubuntu)

❖ Ubuntu Server 16.04 Installation (선택)

① **ip link show** # Check Interfaces

② **Static IP Address Setting**

③ **Host Name Setting**

④ **sudo reboot** # 인터페이스 생성 확인 후 재 리부팅 필요

- SSH Well-known Port 변경 -

```
sudo vi /etc/ssh/sshd_config

# What ports, IPs and protocols we listen for
Port 33322
```

- 계정 암호 변경 -

```
To change the root password:
sudo passwd
To change your user password:
passwd
To change other users password:
sudo passwd USERNAME
```

- 호스트 이름 변경 -

```
/etc/hostname
/etc/hosts
sudo nano /etc/hostname
sudo vi /etc/hosts

cntl+o → enter →  cntl+x
```

- 고정 IP 주소 설정-

```
sudo vi /etc/network/interfaces

# Iface ens160 inet dhcp
iface ens160 inet static
        address 192.168.0.xx
        netmask 255.255.255.0
        gateway 192.168.0.1
        dns-nameservers 1.1.1.1

sudo /etc/init.d/networking restart (or reboot)
```

- Root 계정 생성 -

```
sudo -l
passwd
sudo passwd root
```

- Putty to VyOS for sshd-

```
192.168.1.xxx @ Putty for VyOS
ssh jslab@192.168.0.yy
```

메모:

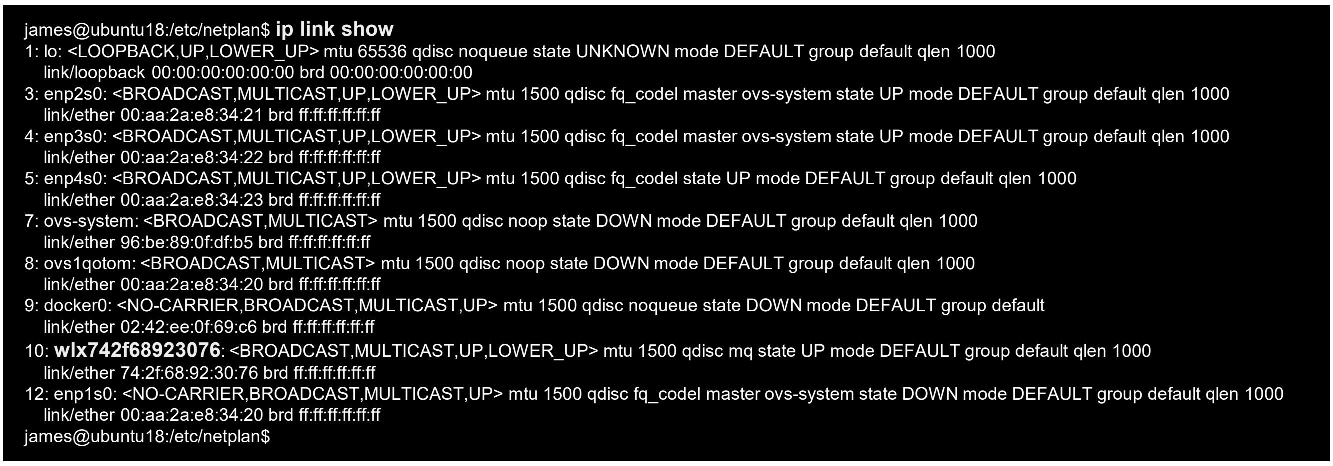
- Ubuntu Server 루트계정 활성화: sudo passwd root
- VM 이미지 Import 시 네트워크 인터페이스 확인 위한 명령어 'ip link show'
- Ping time 비교 1.1.1.1 vs. 8.8.8.8
- Root 계정으로 실행 필요시 (sudo 사용 일반 계정은 실행하지 못함)
  루트계정 활성화: sudo passwd root

3. Host 설치 (Ubuntu)

❖ **Static IP for WiFi** (Ubuntu 18.04)

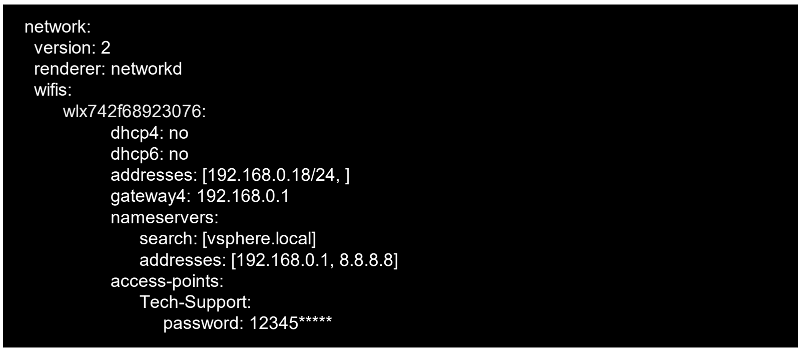
- **OVS (Open vSwitch) Mirroring 용 (2.8.0)**

1. **ip link show**



```
james@ubuntu18:/etc/netplan$ ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
3: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master ovs-system state UP mode DEFAULT group default qlen 1000
    link/ether 00:aa:2a:e8:34:21 brd ff:ff:ff:ff:ff:ff
4: enp3s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master ovs-system state UP mode DEFAULT group default qlen 1000
    link/ether 00:aa:2a:e8:34:22 brd ff:ff:ff:ff:ff:ff
5: enp4s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 00:aa:2a:e8:34:23 brd ff:ff:ff:ff:ff:ff
7: ovs-system: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN mode DEFAULT group default qlen 1000
    link/ether 96:be:89:0f:df:b5 brd ff:ff:ff:ff:ff:ff
8: ovs1qotom: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:aa:2a:e8:34:20 brd ff:ff:ff:ff:ff:ff
9: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default
    link/ether 02:42:ee:0f:69:c6 brd ff:ff:ff:ff:ff:ff
10: wlx742f68923076: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP mode DEFAULT group default qlen 1000
    link/ether 74:2f:68:92:30:76 brd ff:ff:ff:ff:ff:ff
12: enp1s0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel master ovs-system state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:aa:2a:e8:34:20 brd ff:ff:ff:ff:ff:ff
james@ubuntu18:/etc/netplan$
```

2. **cd /etc/netplan**
3. **sudo nano 01-network-manager-all.yaml**



```
network:
  version: 2
  renderer: networkd
  wifis:
        wlx742f68923076:
                  dhcp4: no
                  dhcp6: no
                  addresses: [192.168.0.18/24, ]
                  gateway4: 192.168.0.1
                  nameservers:
                        search: [vsphere.local]
                        addresses: [192.168.0.1, 8.8.8.8]
                  access-points:
                        Tech-Support:
                             password: 12345*****
```

4. **sudo netplan generate**
5. **sudo netplan apply**

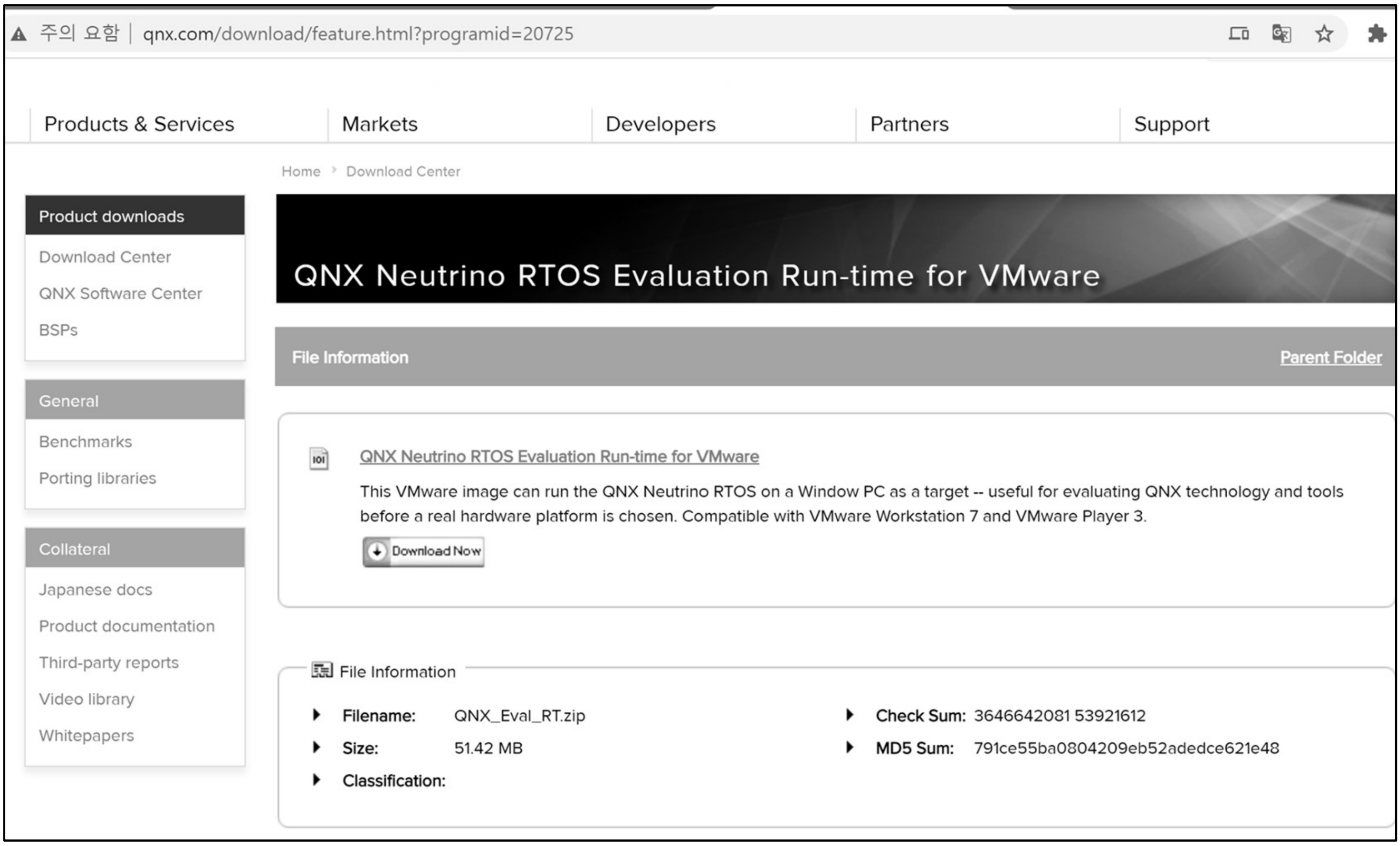
메모:

❖ https://www.tecmint.com/configure-network-static-ip-address-in-ubuntu/

3. Host 설치 (QNX)

❖ VMware 이미지 (QNX)

- **QNX Neutrino RTOS VMware 이미지 다운로드 주소 http://www.qnx.com/download/feature.html?programid=20725**
- **VMware 이미지 생성: https://www.on-time.com/rtos-32-docs/rttarget-32/programming-manual/advanced-topics/virtual-target/vmware.htm**



QNX Neutrino RTOS Evaluation Run-time for VMware

QNX Neutrino RTOS Evaluation Run-time for VMware

This VMware image can run the QNX Neutrino RTOS on a Window PC as a target -- useful for evaluating QNX technology and tools before a real hardware platform is chosen. Compatible with VMware Workstation 7 and VMware Player 3.

File Information

- Filename: QNX_Eval_RT.zip
- Size: 51.42 MB
- Classification:
- Check Sum: 3646642081 53921612
- MD5 Sum: 791ce55ba0804209eb52adedce621e48

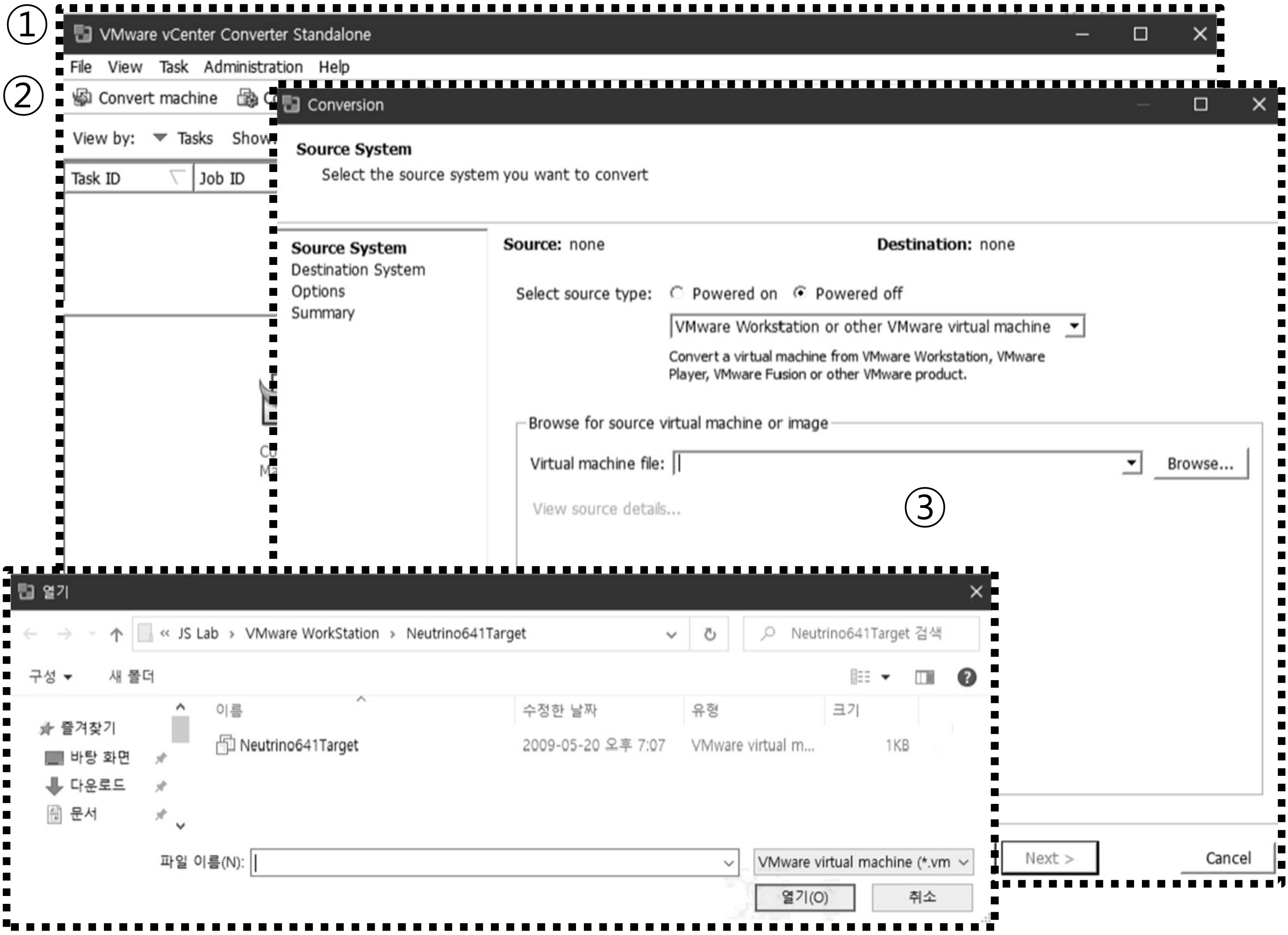
메모:

❖ This VMware image can run the QNX Neutrino RTOS on a Window PC as a target

3. Host 설치 (QNX)

❖ VMware vCenter Converter Standalone (QNX)

① **Start VMware vCenter Converter Standalone**
② **Convert machine**
③ **VM Image 선택**



①
②
③
VMware vCenter Converter Standalone
File View Task Administration Help
Convert machine
View by: Tasks Show
Task ID
Job ID
Conversion
Source System
Select the source system you want to convert
Source System
Destination System
Options
Summary
Source: none
Destination: none
Select source type: ○ Powered on ● Powered off
VMware Workstation or other VMware virtual machine
Convert a virtual machine from VMware Workstation, VMware Player, VMware Fusion or other VMware product.
Browse for source virtual machine or image
Virtual machine file:
Browse...
View source details...
Next >
Cancel
열기
« JS Lab › VMware WorkStation › Neutrino641Target
Neutrino641Target 검색
구성 ▾
새 폴더
즐겨찾기
바탕 화면
다운로드
문서
이름
수정한 날짜
유형
크기
Neutrino641Target
2009-05-20 오후 7:07
VMware virtual m...
1KB
파일 이름(N):
VMware virtual machine (*.vm
열기(O)
취소

메모:

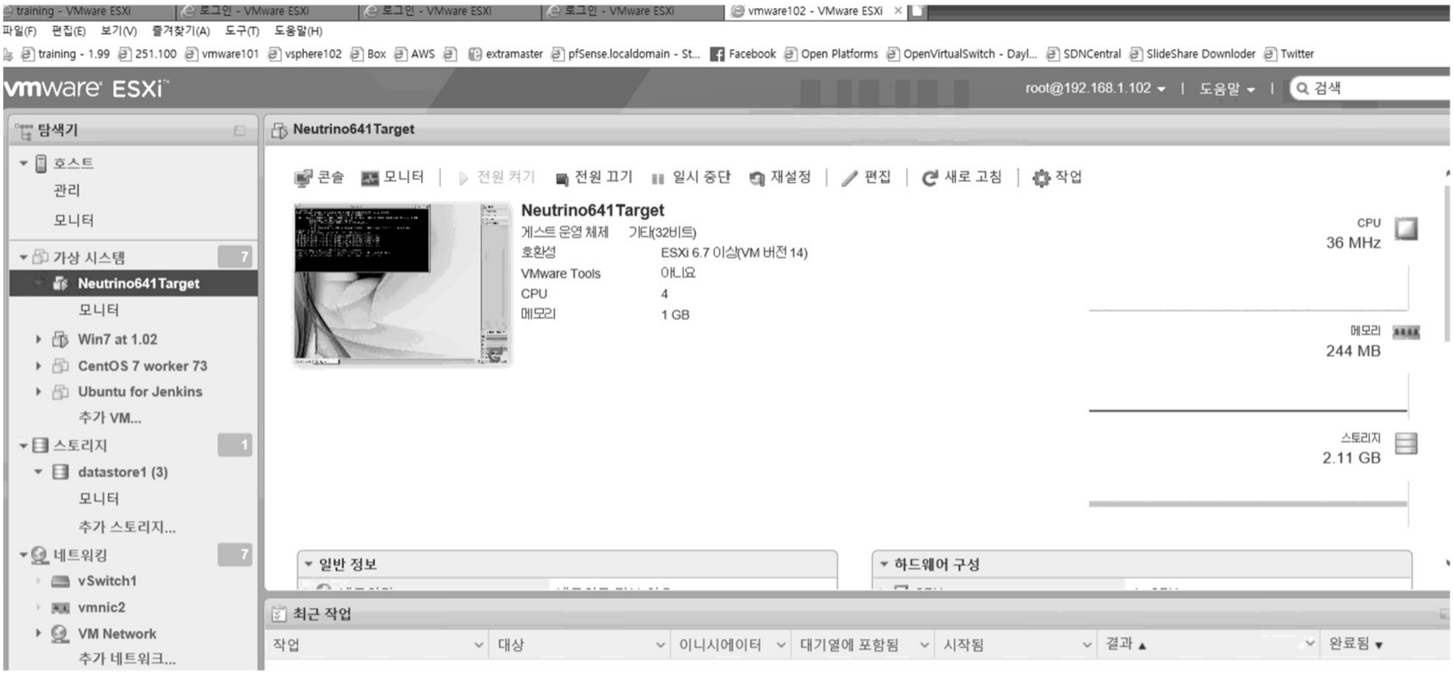
- ❖ http://www.qnx.com/download/feature.html?programid=20725
- ❖ https://www.on-time.com/rtos-32-docs/rttarget-32/programming-manual/advanced-topics/virtual-target/vmware.htm

3. Host 설치 (QNX)

❖ VMware vCenter Converter Standalone (QNX)

① 설정 확인

② Start a new virtual machine QNX



Neutrino641Target

게스트 운영 체제	기타(32비트)
호환성	ESXi 6.7 이상(VM 버전 14)
VMware Tools	아니요
CPU	4
메모리	1 GB

CPU 36 MHz

메모리 244 MB

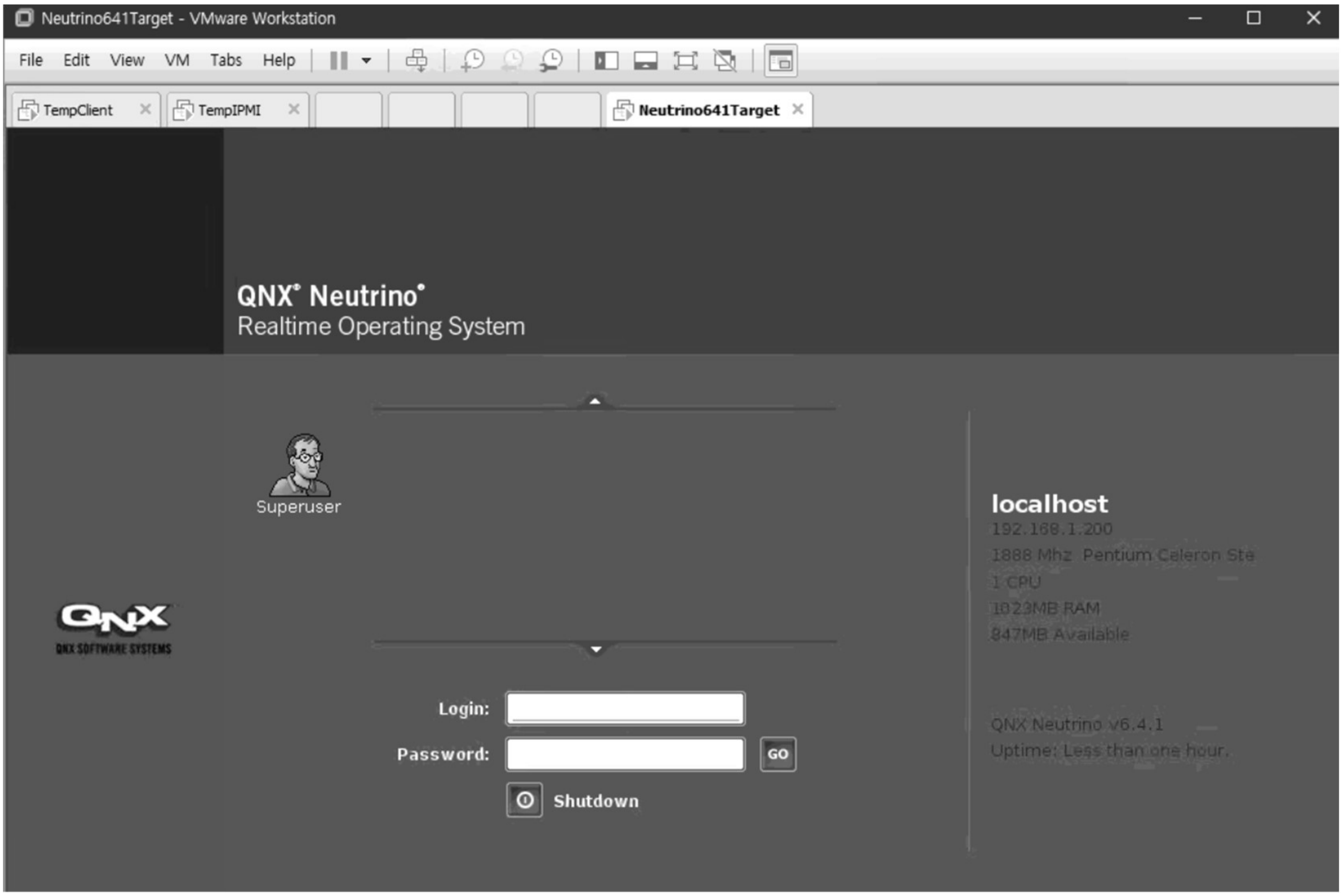
스토리지 2.11 GB

메모:

3. Host 설치 (QNX)

❖ RTOS QNX 접속 로그인

- 콘솔 접속
- Login ID: root (root without password)



localhost
192.168.1.200
1888 Mhz Pentium Celeron Ste
1 CPU
1023MB RAM
847MB Available

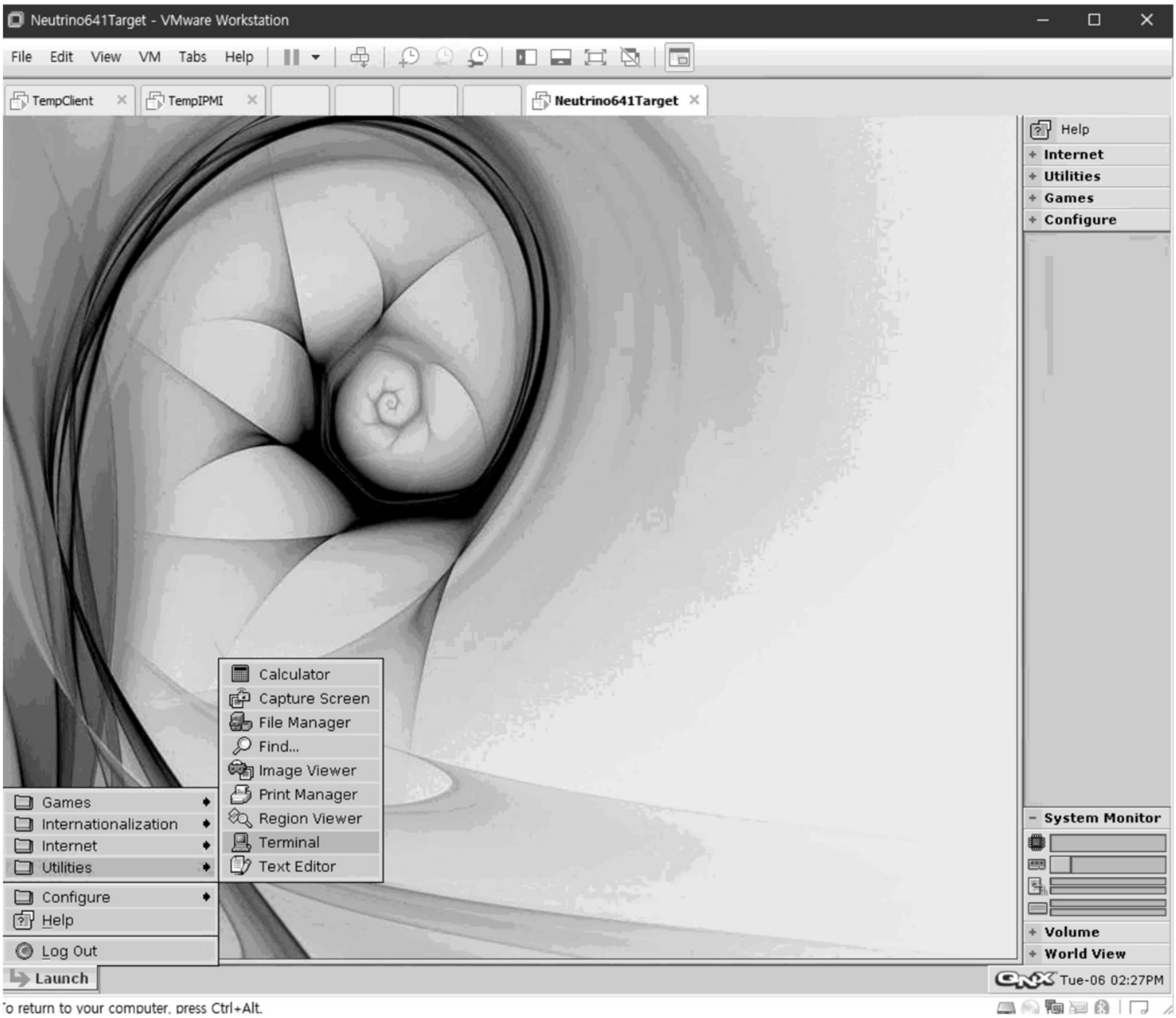
QNX Neutrino v6.4.1
Uptime: Less than one hour.

메모:

3. Host 설치 (QNX)

❖ RTOS QNX 접속 로그인

- 터미널 실행



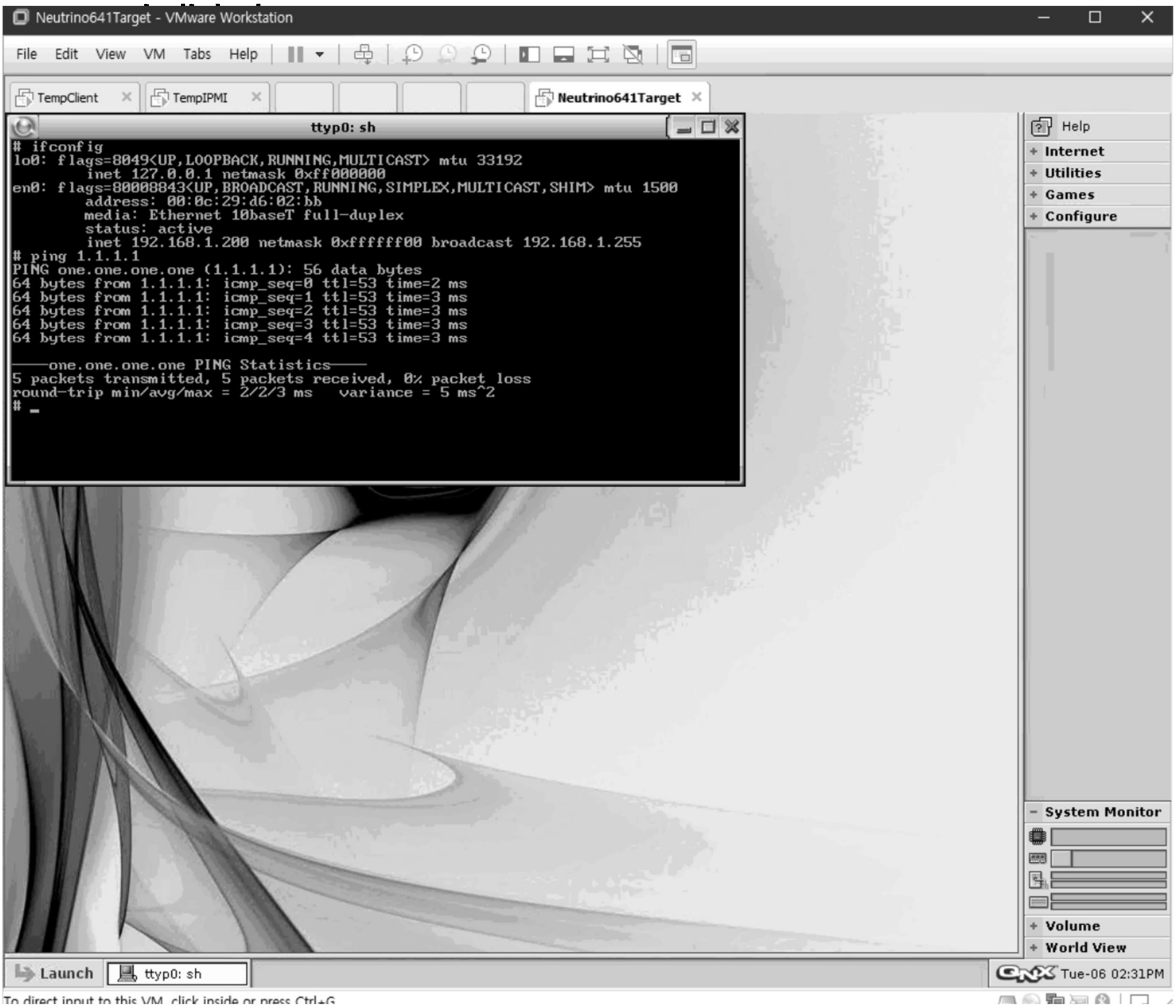
메모:

❖ https://www.tecmint.com/configure-network-static-ip-address-in-ubuntu/

3. Host 설치 (QNX)

❖ 네트워크 연결 확인 (RTOS QNX)

- **Ping 사용 확인**



```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:d6:02:bb
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.1.200 netmask 0xffffff00 broadcast 192.168.1.255
# ping 1.1.1.1
PING one.one.one.one (1.1.1.1): 56 data bytes
64 bytes from 1.1.1.1: icmp_seq=0 ttl=53 time=2 ms
64 bytes from 1.1.1.1: icmp_seq=1 ttl=53 time=3 ms
64 bytes from 1.1.1.1: icmp_seq=2 ttl=53 time=3 ms
64 bytes from 1.1.1.1: icmp_seq=3 ttl=53 time=3 ms
64 bytes from 1.1.1.1: icmp_seq=4 ttl=53 time=3 ms

----one.one.one.one PING Statistics----
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 2/2/3 ms   variance = 5 ms^2
# _
```

메모:

❖ https://www.tecmint.com/configure-network-static-ip-address-in-ubuntu/

1. **Hypervisor**
2. **vRouter**
3. **Host 설치**
   - **CentOS 7**
   - **Ubuntu 16.04**
   - **QNX**

❖ **부록: VMware Lab 운영**

- **WorkStation**
- **KVM/QEMU**
- **vCenter Converter Standalone**

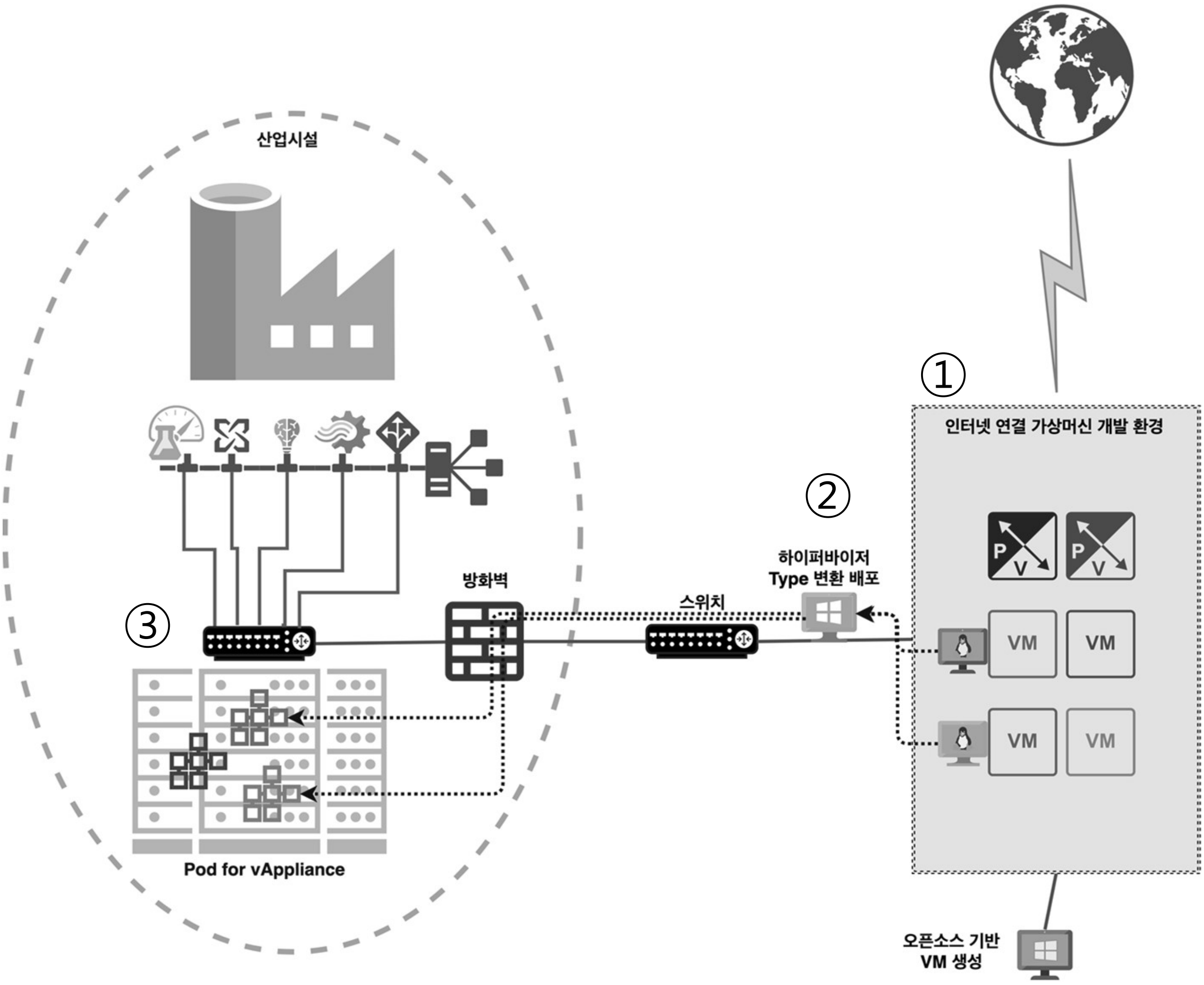
부록. VMware Lab 운영

❖ WorkStation (1 of 10)

① **인터넷 연결 환경에서 VM 개발** (VMware WorkStation)

② **생성 VM을 변환**(Converter)**하여 생산시설에 배포** (VMware vCenter Converter Standalone)

③ **변환 VM은 가상화 시스템에서 구동** (vSphere ESXi)



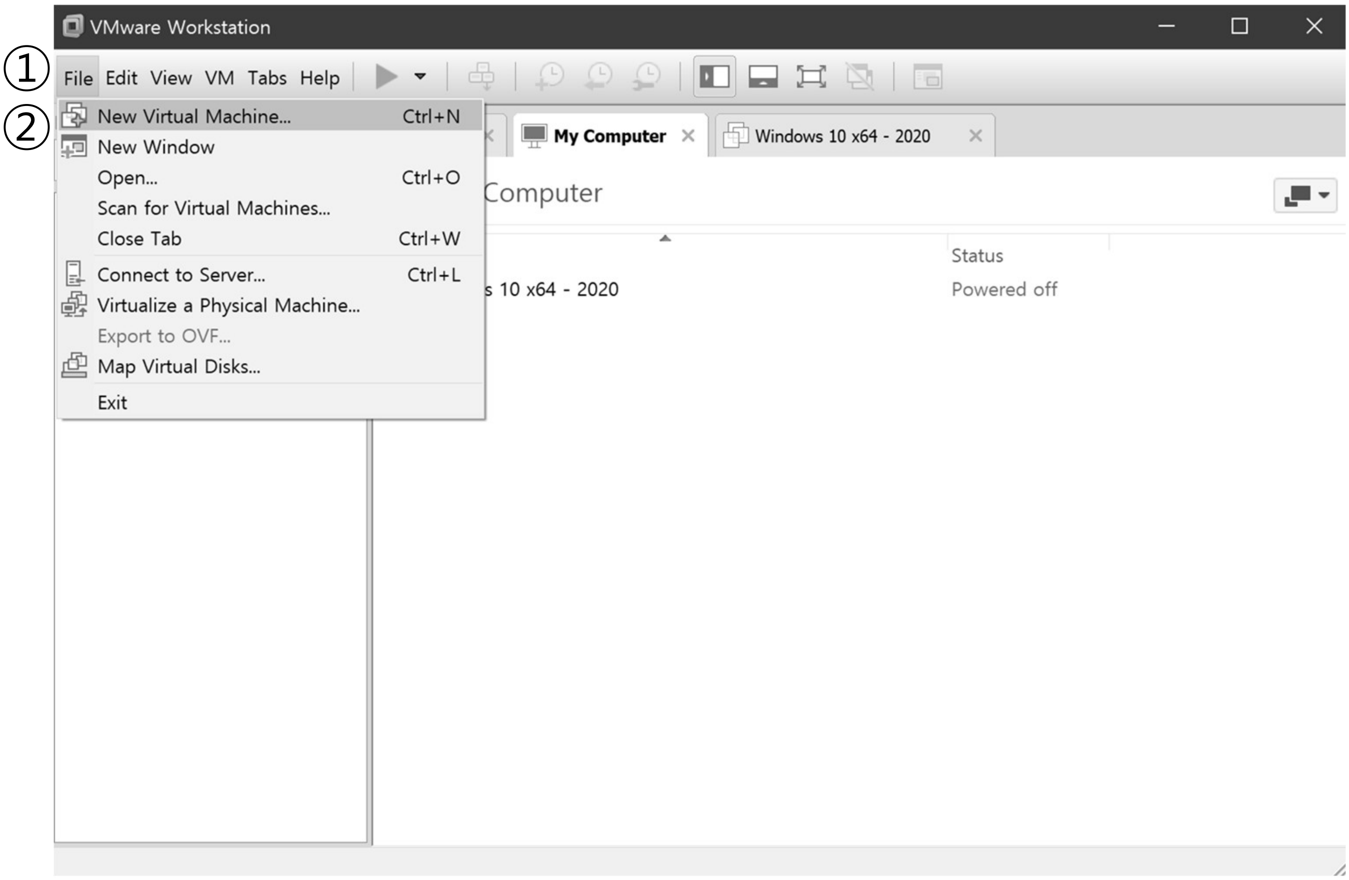
메모:

부록. VMware Lab 운영

❖ WorkStation (2 of 10)

① **File 선택**

② **New Virtual Machine 선택**

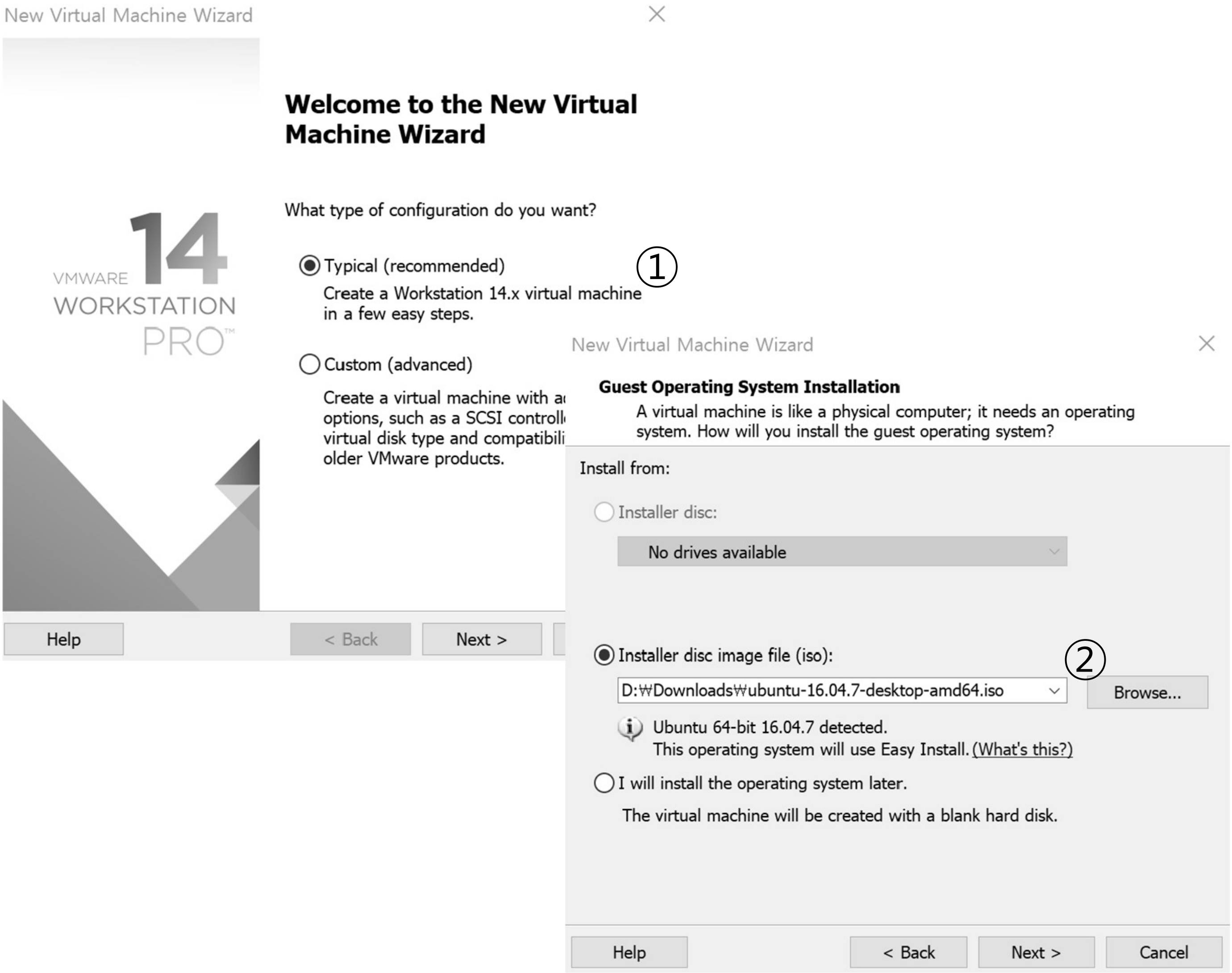


메모:

❖ **WorkStation** (3 of 10)

① **Typical 선택하여 Next**

② **Ubuntu Desktop 16.04 ISO 파일 선택**



New Virtual Machine Wizard

Welcome to the New Virtual Machine Wizard

What type of configuration do you want?

● Typical (recommended) ①

Create a Workstation 14.x virtual machine in a few easy steps.

○ Custom (advanced)

Create a virtual machine with a
options, such as a SCSI controll
virtual disk type and compatibili
older VMware products.

New Virtual Machine Wizard

Guest Operating System Installation

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): ②

D:₩Downloads₩ubuntu-16.04.7-desktop-amd64.iso

Ubuntu 64-bit 16.04.7 detected.
This operating system will use Easy Install. (What's this?)

○ I will install the operating system later.

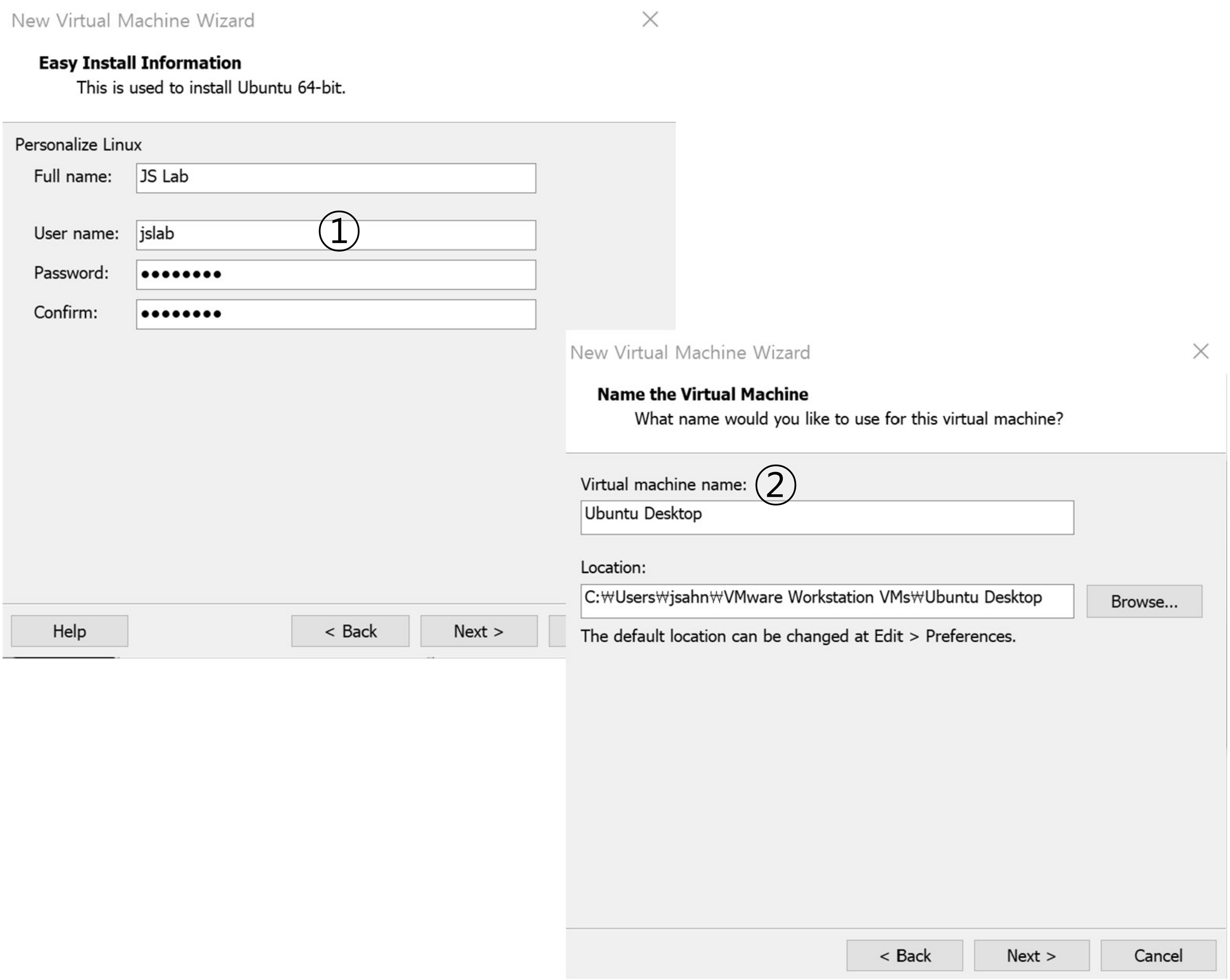
The virtual machine will be created with a blank hard disk.

메모:

❖ WorkStation (4 of 10)

① 설치 계정 정보 입력 후 Next

② VM 이름과 설치위치 설정 후 Next



New Virtual Machine Wizard

Easy Install Information

This is used to install Ubuntu 64-bit.

Personalize Linux

Full name: JS Lab

User name: jslab ①

Password: ●●●●●●●●●

Confirm: ●●●●●●●●●

New Virtual Machine Wizard

Name the Virtual Machine

What name would you like to use for this virtual machine?

Virtual machine name: ②

Ubuntu Desktop

Location:

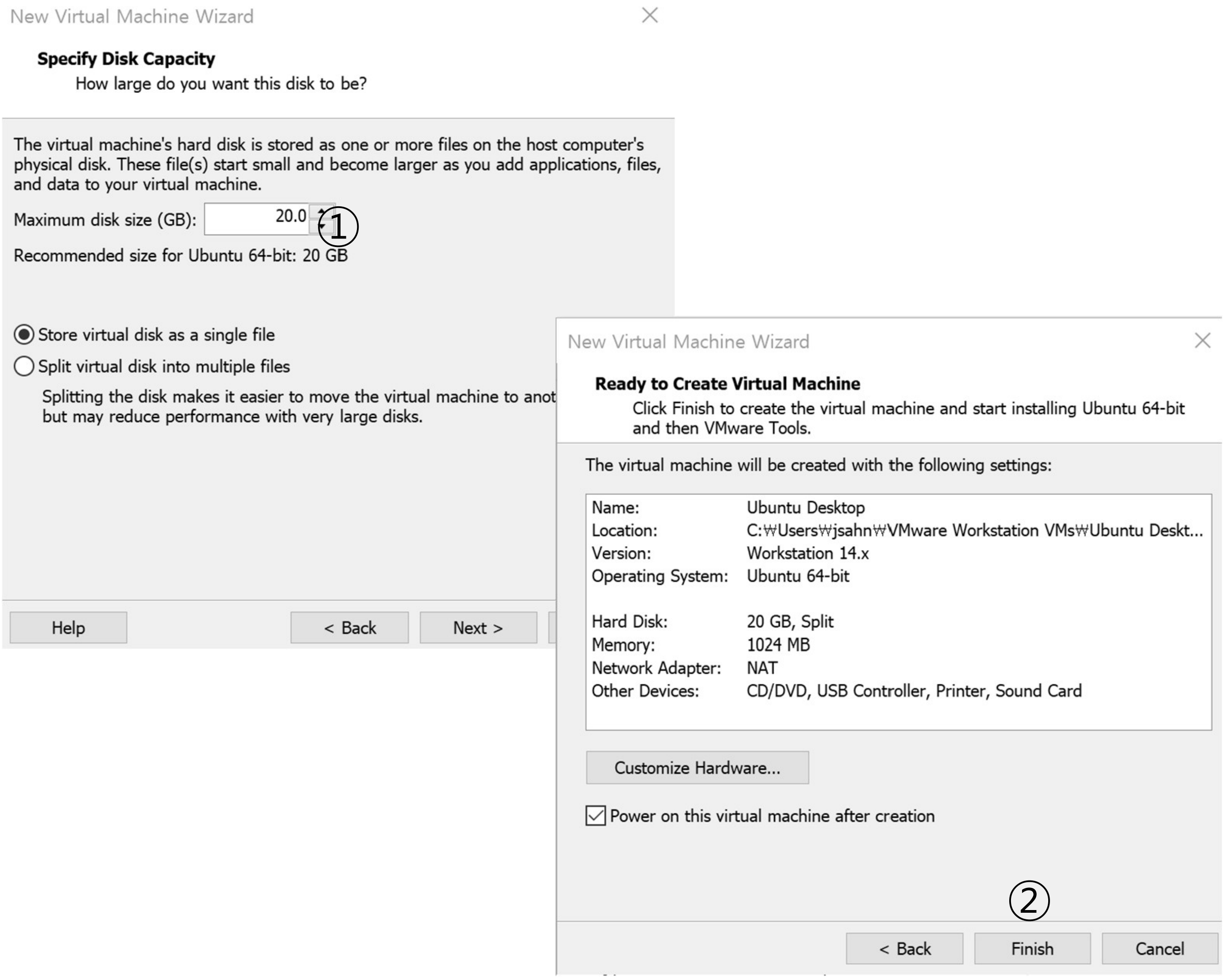
C:₩Users₩jsahn₩VMware Workstation VMs₩Ubuntu Desktop

The default location can be changed at Edit > Preferences.

메모:

❖ WorkStation (5 of 10)

① 디스크 설정 후 Next
② 설정 확인 후 Finish



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): 20.0 ①

Recommended size for Ubuntu 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 anot
but may reduce performance with very large disks.

New Virtual Machine Wizard

Ready to Create Virtual Machine
Click Finish to create the virtual machine and start installing Ubuntu 64-bit and then VMware Tools.

The virtual machine will be created with the following settings:

Name:	Ubuntu Desktop
Location:	C:₩Users₩jsahn₩VMware Workstation VMs₩Ubuntu Deskt...
Version:	Workstation 14.x
Operating System:	Ubuntu 64-bit
Hard Disk:	20 GB, Split
Memory:	1024 MB
Network Adapter:	NAT
Other Devices:	CD/DVD, USB Controller, Printer, Sound Card

☑ Power on this virtual machine after creation

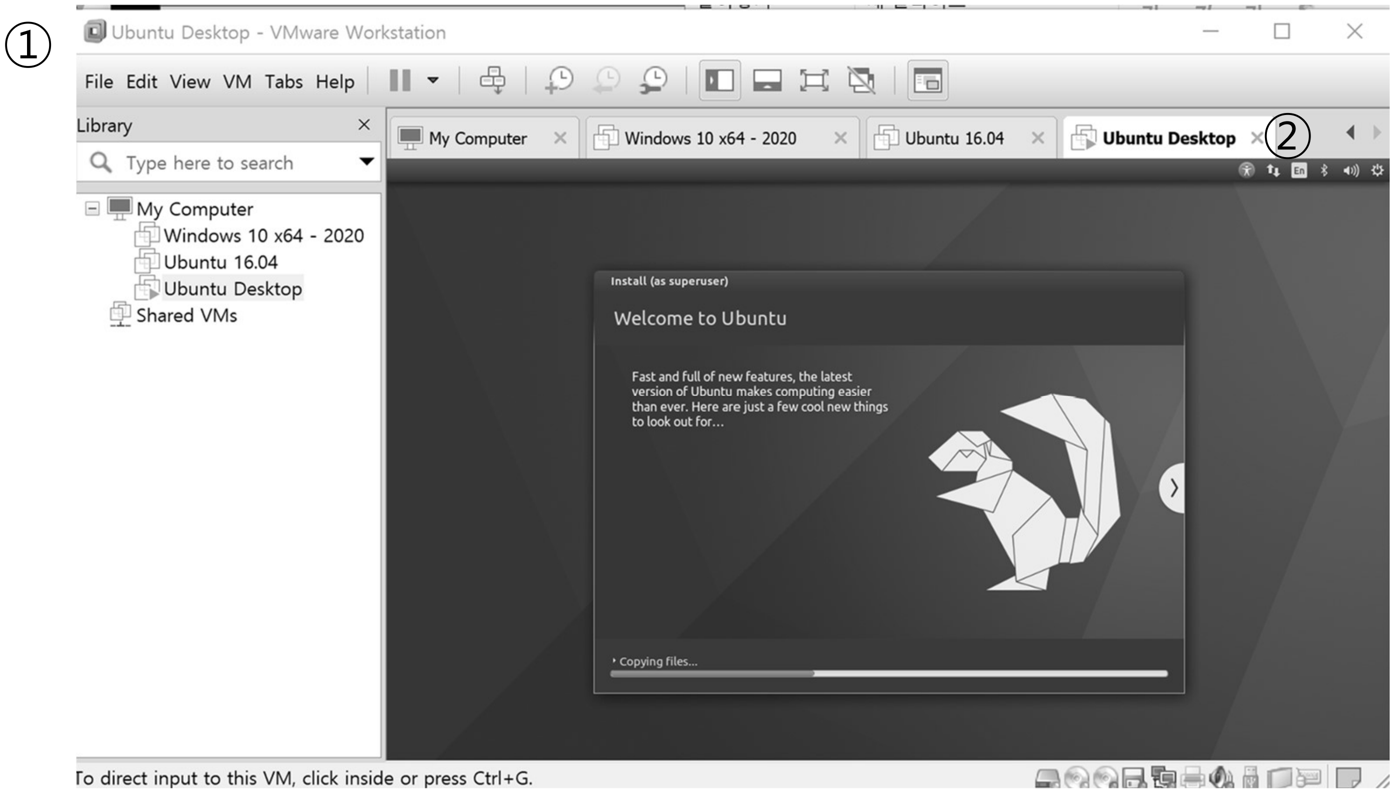
메모:

부록. VMware Lab 운영

❖ **WorkStation** (6 of 10)

① **설치 터미널 창 확인**

② **Ubuntu Desktop 16.04 설치** (이후 서버 설치 방법 동일)



Install (as superuser)

Welcome to Ubuntu

Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for...

Copying files...

To direct input to this VM, click inside or press Ctrl+G.

메모:

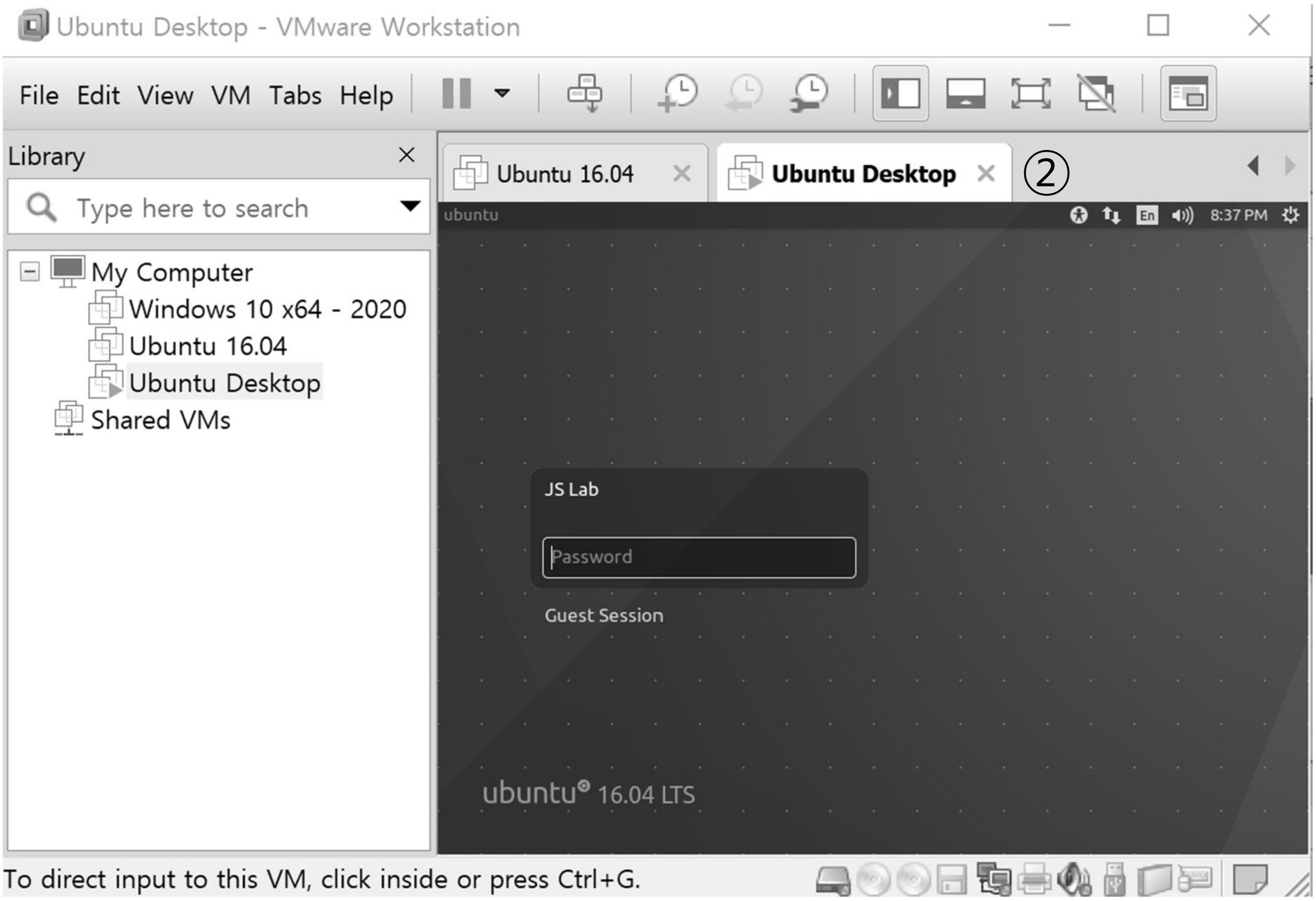
부록. VMware Lab 운영

❖ **WorkStation** (7 of 10)

① **Ubuntu Desktop 16.04 설치 완료 확인**

② **Ubuntu Desktop 16.04 계정 입력**

①



Ubuntu Desktop - VMware Workstation

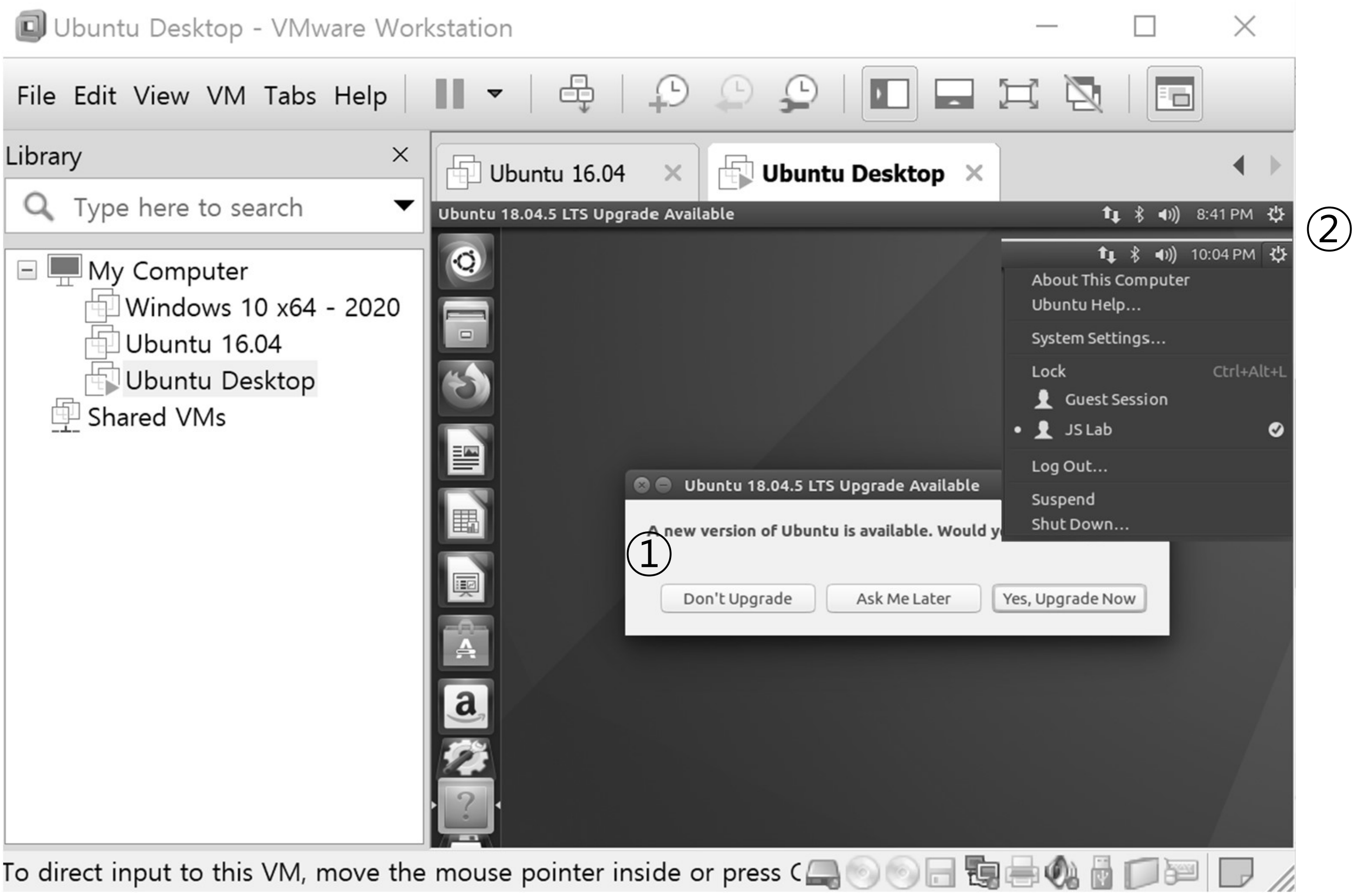
To direct input to this VM, click inside or press Ctrl+G.

메모:

❖ **WorkStation** (8 of 10)

① **Don't' Upgrade 확인**

② **Shut Down** (설정 확인을 위해서 셧다운 함)



Ubuntu 18.04.5 LTS Upgrade Available

A new version of Ubuntu is available. Would y

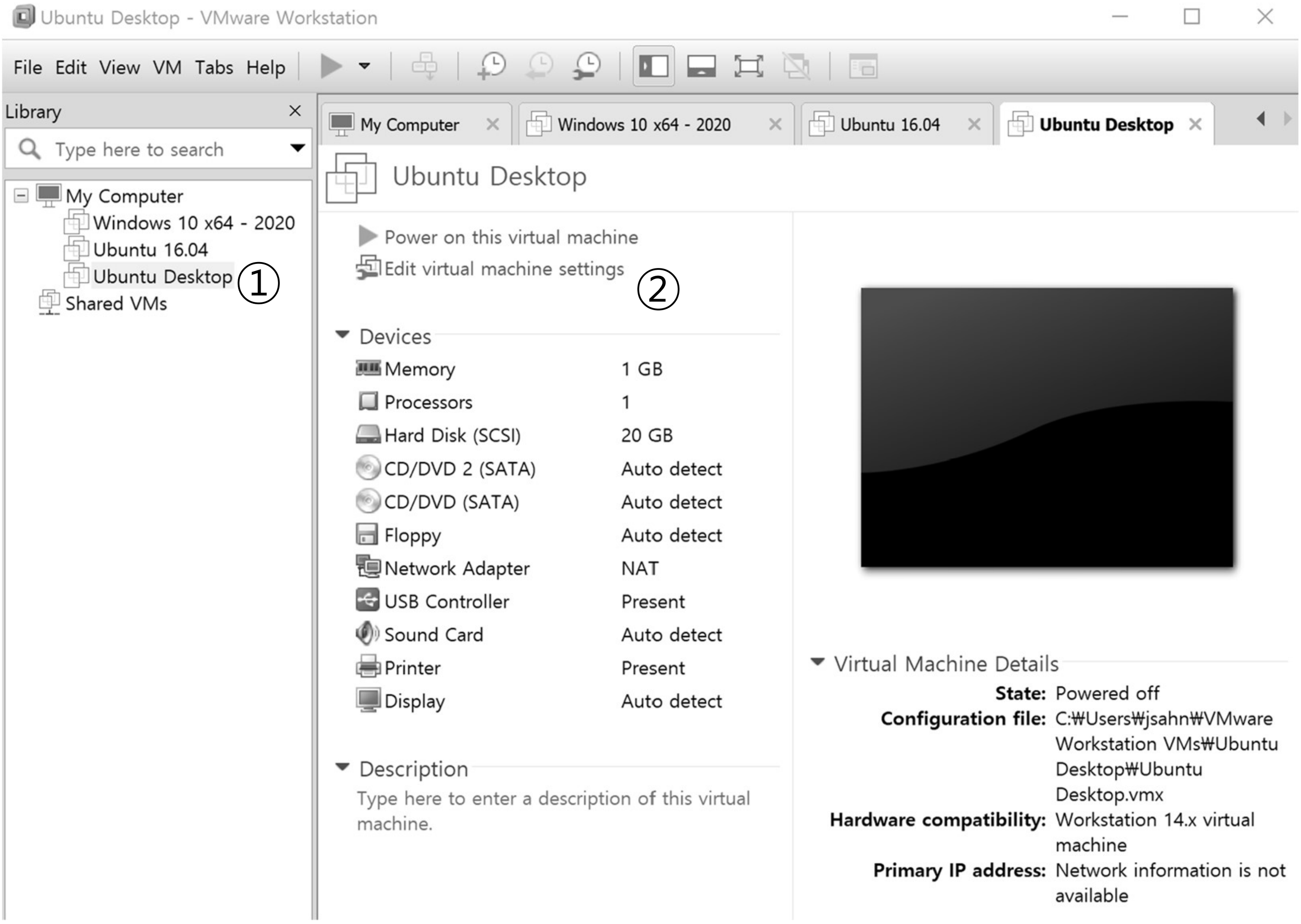
메모:

부록. VMware Lab 운영

❖ **WorkStation** (9 of 10)

① **Ubuntu Desktop 확인**

② **설정 변경 ‘Edit virtual machine settings’ 확인**



Memory	1 GB
Processors	1
Hard Disk (SCSI)	20 GB
CD/DVD 2 (SATA)	Auto detect
CD/DVD (SATA)	Auto detect
Floppy	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Type here to enter a description of this virtual machine.

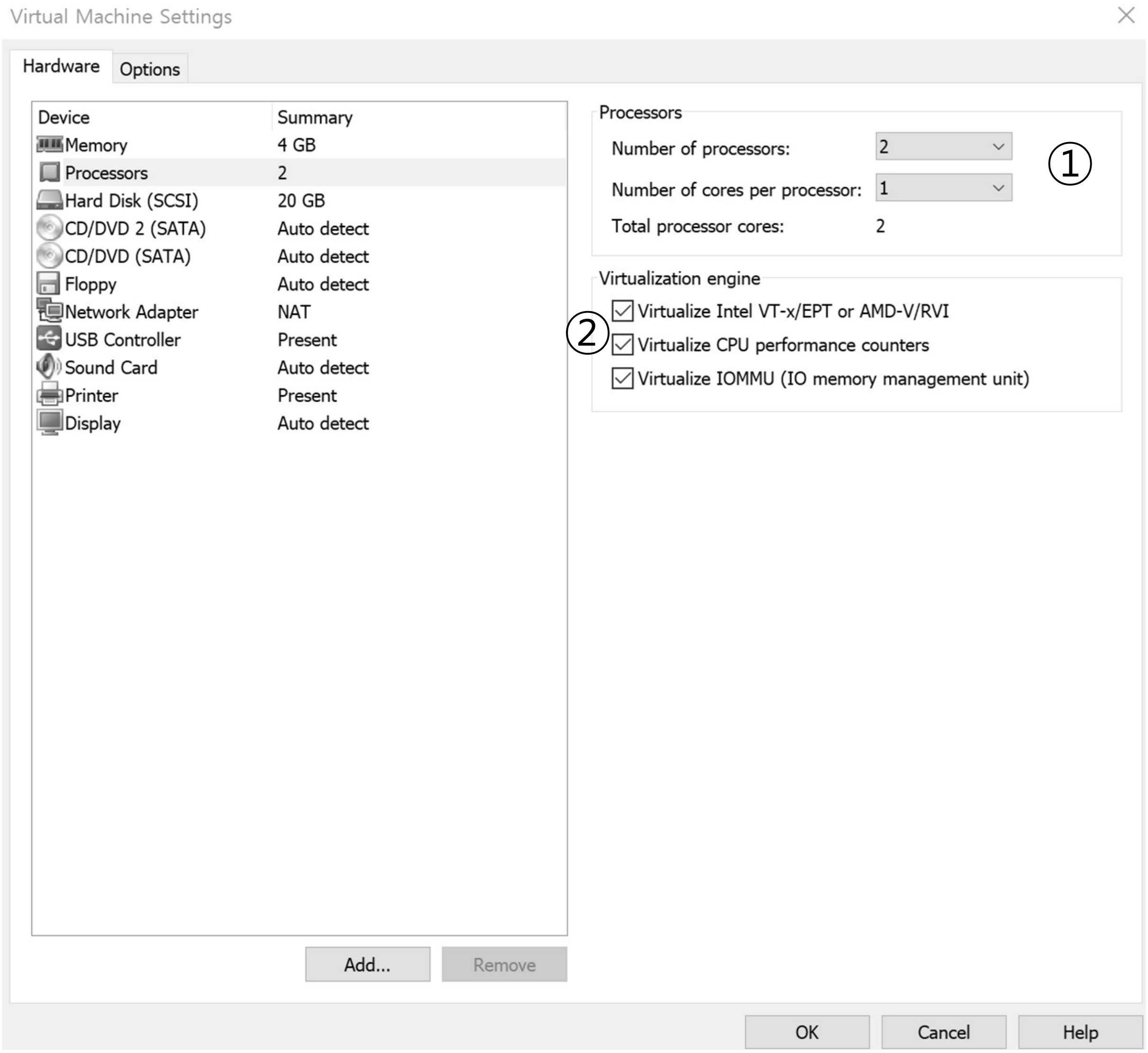
State: Powered off
Configuration file: C:₩Users₩jsahn₩VMware Workstation VMs₩Ubuntu Desktop₩Ubuntu Desktop.vmx
Hardware compatibility: Workstation 14.x virtual machine
Primary IP address: Network information is not available

메모:

❖ **WorkStation** (10 of 10)

① **vCPU 추가**

② **가상화 지원 확인 후 OK**



Virtual Machine Settings

Device	Summary
Memory	4 GB
Processors	2
Hard Disk (SCSI)	20 GB
CD/DVD 2 (SATA)	Auto detect
CD/DVD (SATA)	Auto detect
Floppy	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Processors

Number of processors: 2

Number of cores per processor: 1

Total processor cores: 2

①

Virtualization engine

②
☑ Virtualize Intel VT-x/EPT or AMD-V/RVI
☑ Virtualize CPU performance counters
☑ Virtualize IOMMU (IO memory management unit)

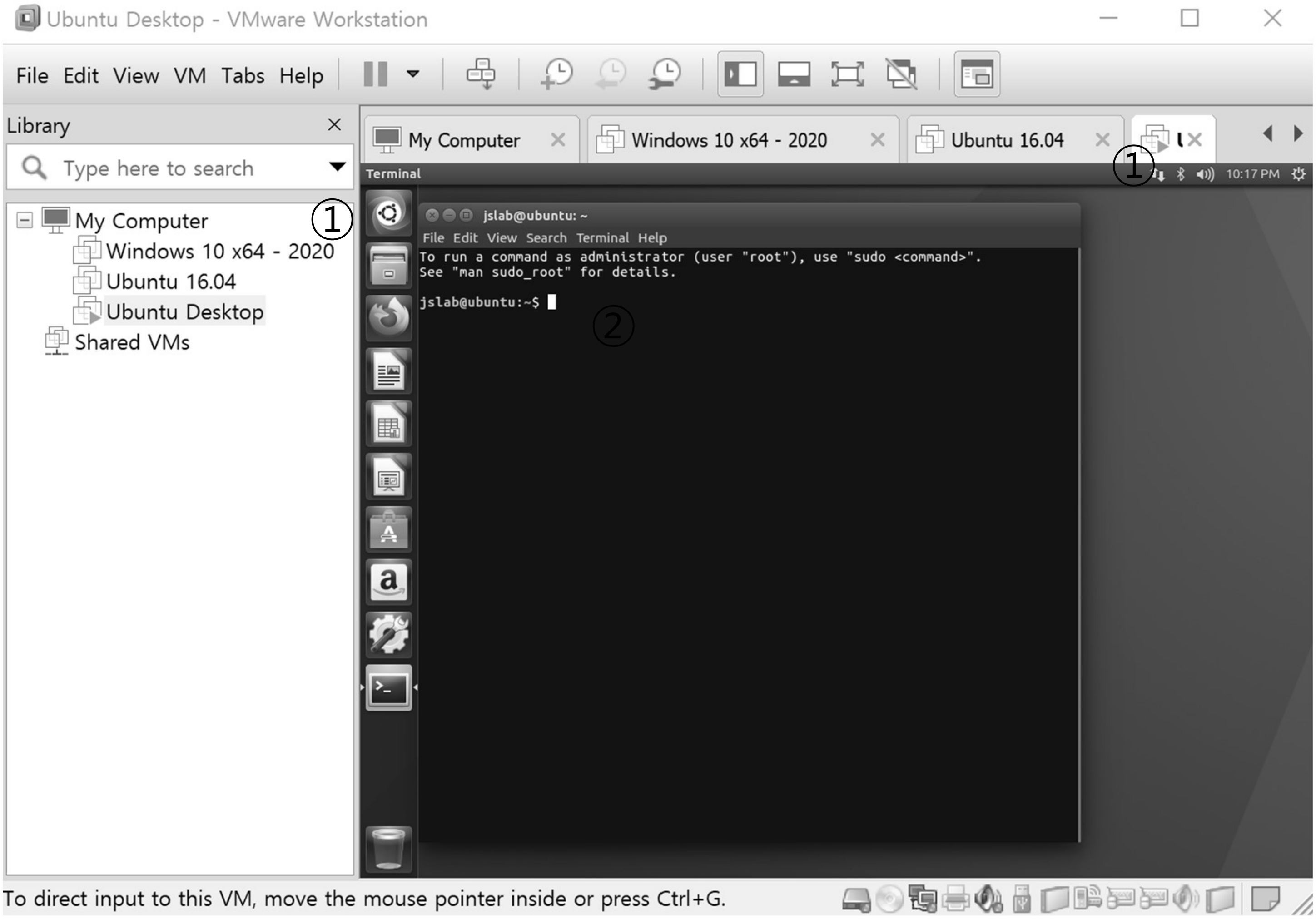
메모:

부록. VMware Lab 운영

❖ **KVM/QEMU** (1 of 29)

① **재시작 후 Terminal 실행**

② **KVM/QEMU 설치 명령어 실행 준비**



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

jslab@ubuntu:~$ 
```

To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

메모:

❖ **KVM/QEMU** (2 of 29)

❖ **Ubuntu Desktop 16.04 Installation (Networking)**

① **sudo apt-get update**

② **sudo apt-get install bridge-utils**

③ **sudo brctl addbr br0**

④ **sudo ip addr show**

⑤ **sudo brctl addif br0 eth0**

⑥ **sudo vim /etc/network/interfaces**

```
### Establishing which interfaces to load at boot and establish the loopback
auto lo br0
iface lo inet loopback
### Set the existing interface to manual to keep it from interfering with the bridge via DHCP
iface eth0 inet manual
### Create the bridge and set it to DHCP.  Link it to the existing interface.
iface br0 inet dhcp
bridge_ports eth0
```

⑦ **sudo systemctl stop network-manager**

⑧ **sudo systemctl disable network-manager**

⑨ **sudo systemctl restart networking**

메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

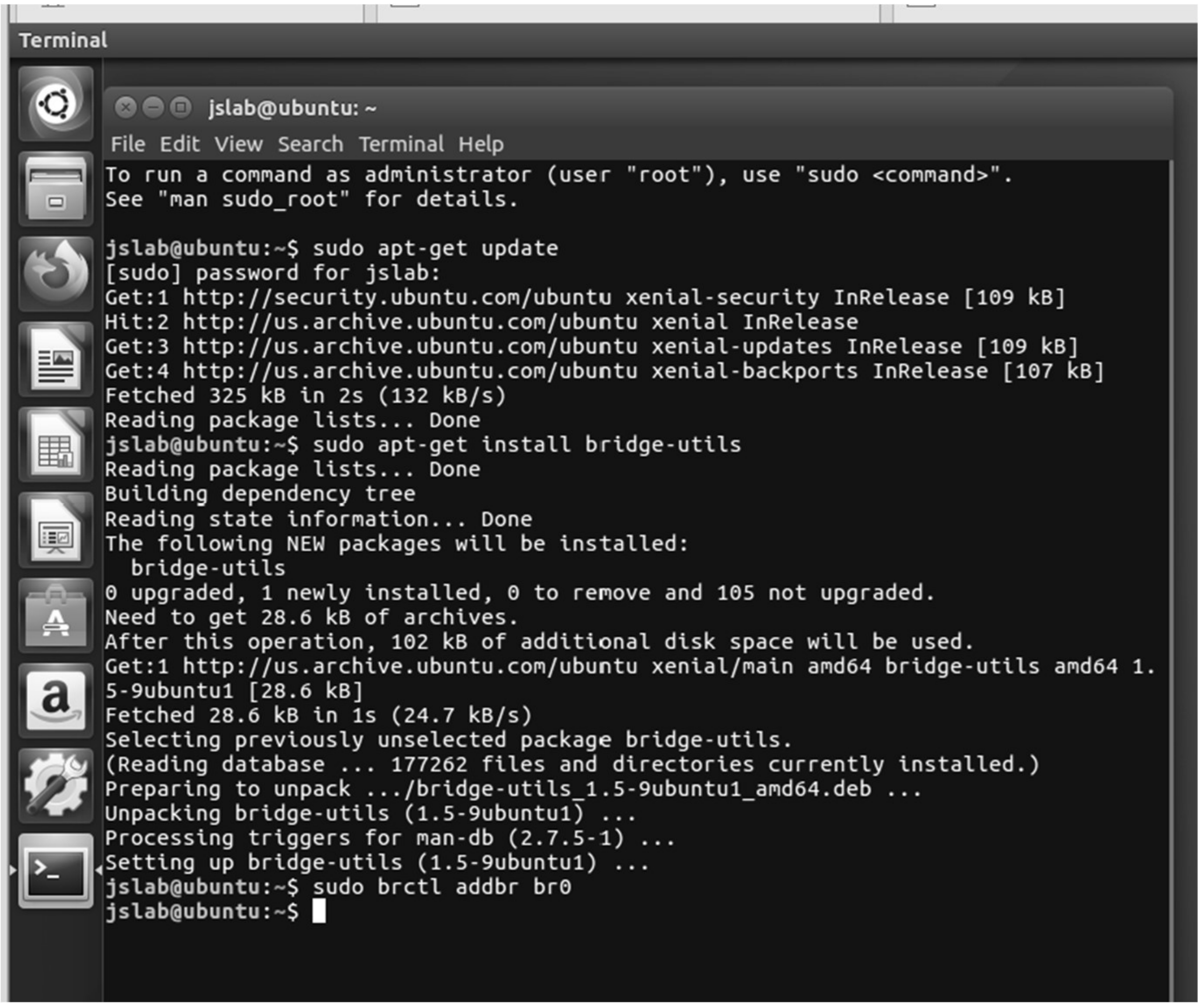
부록. VMware Lab 운영

- ❖ **KVM/QEMU** (3 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (Networking)**

① **sudo apt-get update**

② **sudo apt-get install bridge-utils**

③ **sudo brctl addbr br0**



```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

jslab@ubuntu:~$ sudo apt-get update
[sudo] password for jslab:
Get:1 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]
Hit:2 http://us.archive.ubuntu.com/ubuntu xenial InRelease
Get:3 http://us.archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]
Fetched 325 kB in 2s (132 kB/s)
Reading package lists... Done
jslab@ubuntu:~$ sudo apt-get install bridge-utils
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  bridge-utils
0 upgraded, 1 newly installed, 0 to remove and 105 not upgraded.
Need to get 28.6 kB of archives.
After this operation, 102 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu xenial/main amd64 bridge-utils amd64 1.
5-9ubuntu1 [28.6 kB]
Fetched 28.6 kB in 1s (24.7 kB/s)
Selecting previously unselected package bridge-utils.
(Reading database ... 177262 files and directories currently installed.)
Preparing to unpack .../bridge-utils_1.5-9ubuntu1_amd64.deb ...
Unpacking bridge-utils (1.5-9ubuntu1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up bridge-utils (1.5-9ubuntu1) ...
jslab@ubuntu:~$ sudo brctl addbr br0
jslab@ubuntu:~$ 
```

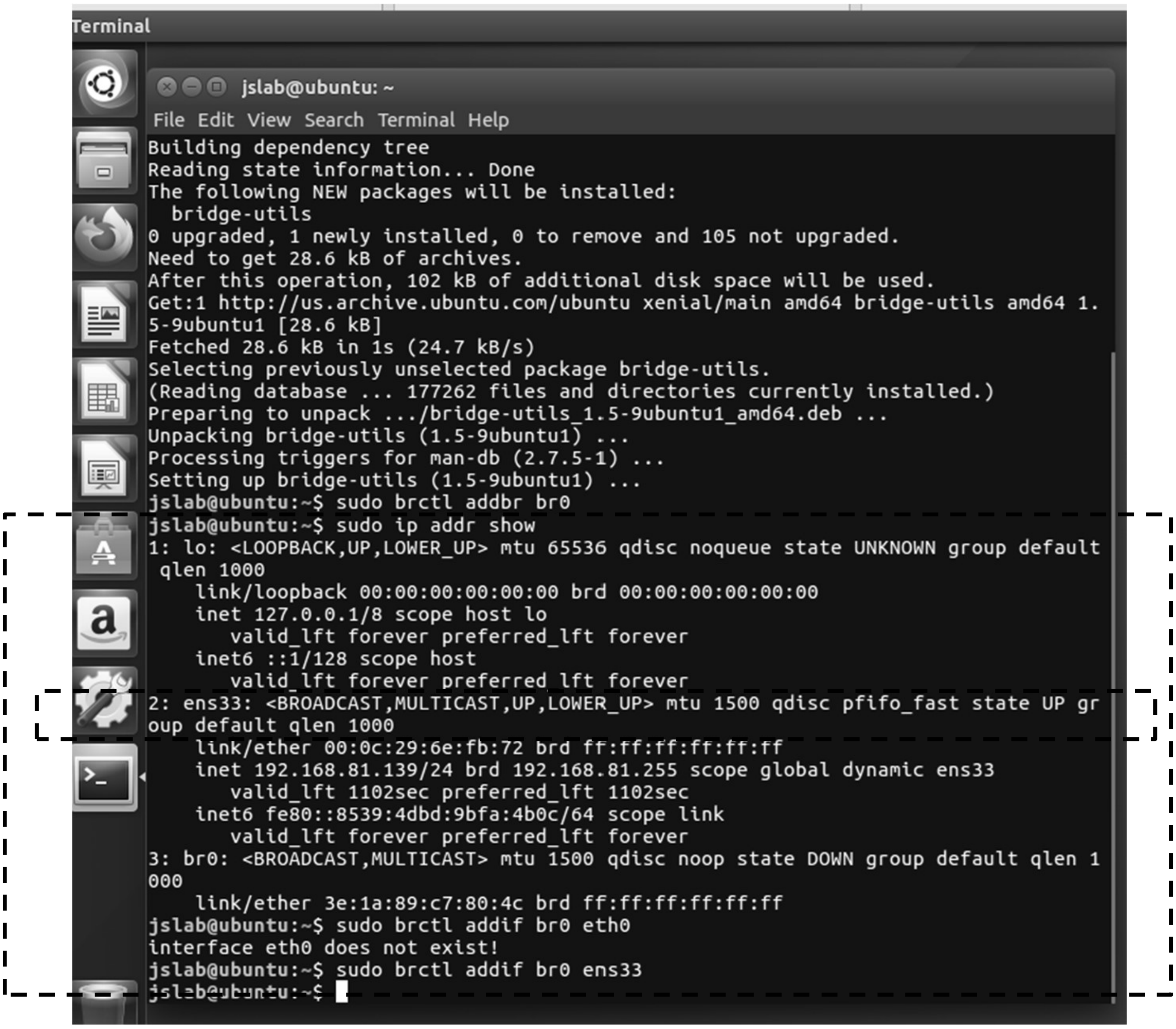
메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

- ❖ **KVM/QEMU** (4 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (Networking)**

① **sudo ip addr show**

② **sudo brctl addif br0 ens33**



```
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  bridge-utils
0 upgraded, 1 newly installed, 0 to remove and 105 not upgraded.
Need to get 28.6 kB of archives.
After this operation, 102 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu xenial/main amd64 bridge-utils amd64 1.
5-9ubuntu1 [28.6 kB]
Fetched 28.6 kB in 1s (24.7 kB/s)
Selecting previously unselected package bridge-utils.
(Reading database ... 177262 files and directories currently installed.)
Preparing to unpack .../bridge-utils_1.5-9ubuntu1_amd64.deb ...
Unpacking bridge-utils (1.5-9ubuntu1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up bridge-utils (1.5-9ubuntu1) ...
jslab@ubuntu:~$ sudo brctl addbr br0
jslab@ubuntu:~$ sudo ip addr show
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 gr
oup default qlen 1000
    link/ether 00:0c:29:6e:fb:72 brd ff:ff:ff:ff:ff:ff
    inet 192.168.81.139/24 brd 192.168.81.255 scope global dynamic ens33
       valid_lft 1102sec preferred_lft 1102sec
    inet6 fe80::8539:4dbd:9bfa:4b0c/64 scope link
       valid_lft forever preferred_lft forever
3: br0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1
000
    link/ether 3e:1a:89:c7:80:4c brd ff:ff:ff:ff:ff:ff
jslab@ubuntu:~$ sudo brctl addif br0 eth0
interface eth0 does not exist!
jslab@ubuntu:~$ sudo brctl addif br0 ens33
jslab@ubuntu:~$
```

메모:

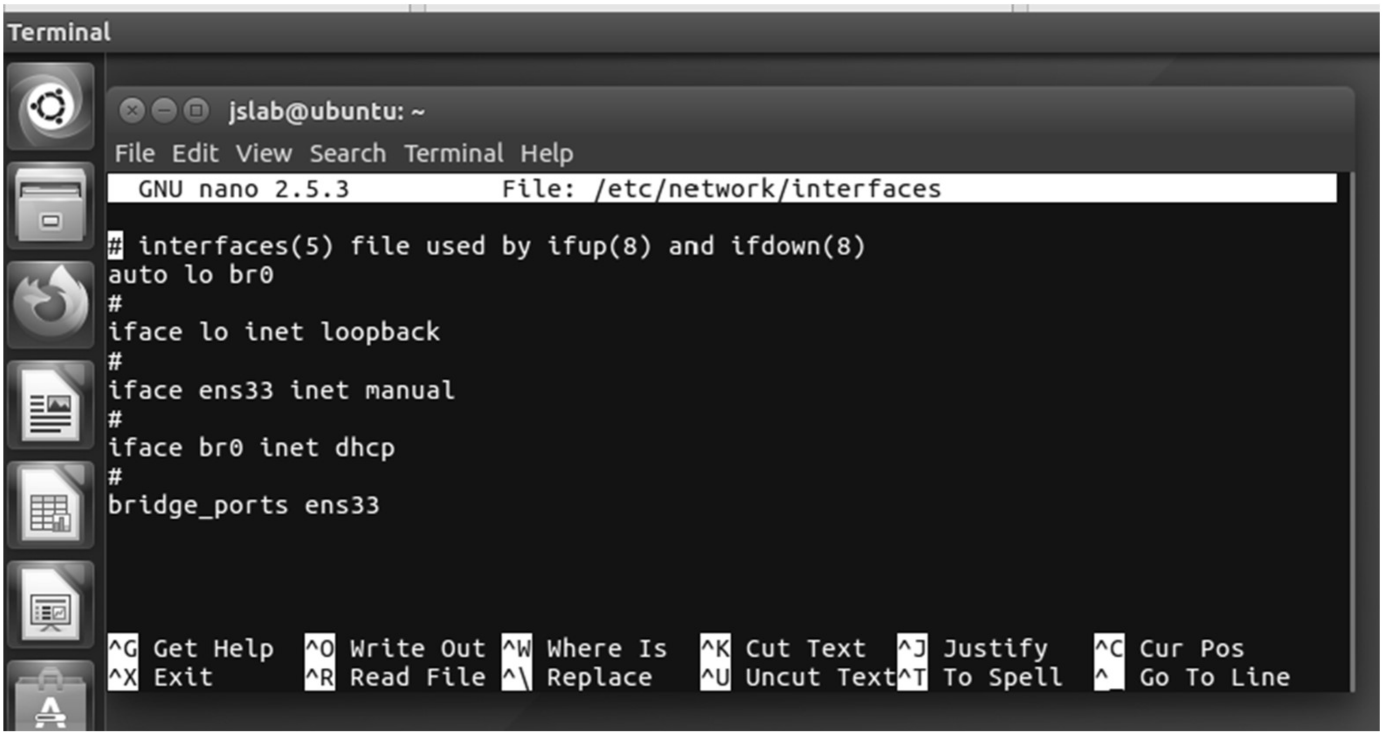
- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

❖ **KVM/QEMU** (5 of 29)

❖ **Ubuntu Desktop 16.04 Installation (Networking)**

① **sudo nano /etc/network/interfaces**

### Establishing which interfaces to load at boot and establish the loopback
auto lo br0
iface lo inet loopback
### Set the existing interface to manual to keep it from interfering with the bridge via DHCP
iface ens33 inet manual
### Create the bridge and set it to DHCP. Link it to the existing interface.
iface br0 inet dhcp
bridge_ports eth0



```
  GNU nano 2.5.3            File: /etc/network/interfaces

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo br0
#
iface lo inet loopback
#
iface ens33 inet manual
#
iface br0 inet dhcp
#
bridge_ports ens33



^G Get Help   ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify    ^C Cur Pos
^X Exit       ^R Read File  ^\ Replace    ^U Uncut Text ^T To Spell   ^_ Go To Line
```

메모:

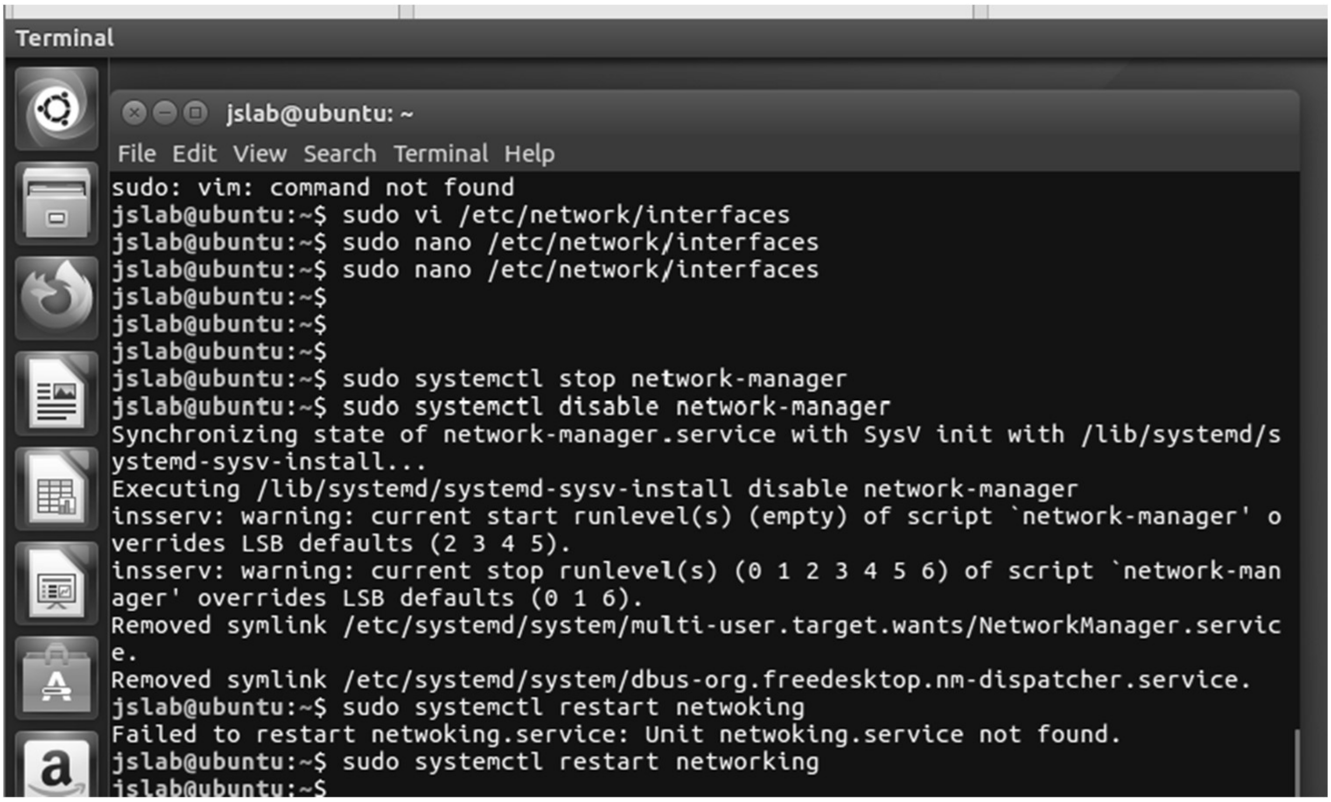
- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

- ❖ **KVM/QEMU** (6 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (Networking)**

① **sudo systemctl stop network-manager**

② **sudo systemctl disable network-manager**

③ **sudo systemctl restart networking**



```
sudo: vim: command not found
jslab@ubuntu:~$ sudo vi /etc/network/interfaces
jslab@ubuntu:~$ sudo nano /etc/network/interfaces
jslab@ubuntu:~$ sudo nano /etc/network/interfaces
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$ sudo systemctl stop network-manager
jslab@ubuntu:~$ sudo systemctl disable network-manager
Synchronizing state of network-manager.service with SysV init with /lib/systemd/s
ystemd-sysv-install...
Executing /lib/systemd/systemd-sysv-install disable network-manager
insserv: warning: current start runlevel(s) (empty) of script `network-manager' o
verrides LSB defaults (2 3 4 5).
insserv: warning: current stop runlevel(s) (0 1 2 3 4 5 6) of script `network-man
ager' overrides LSB defaults (0 1 6).
Removed symlink /etc/systemd/system/multi-user.target.wants/NetworkManager.servic
e.
Removed symlink /etc/systemd/system/dbus-org.freedesktop.nm-dispatcher.service.
jslab@ubuntu:~$ sudo systemctl restart netwoking
Failed to restart netwoking.service: Unit netwoking.service not found.
jslab@ubuntu:~$ sudo systemctl restart networking
jslab@ubuntu:~$
```

메모:

- https://linuxconfig.org/simple-virtualization-with-ubuntu-16-04-and-kvm

부록. VMware Lab 운영

❖ **KVM/QEMU** (7 of 29)

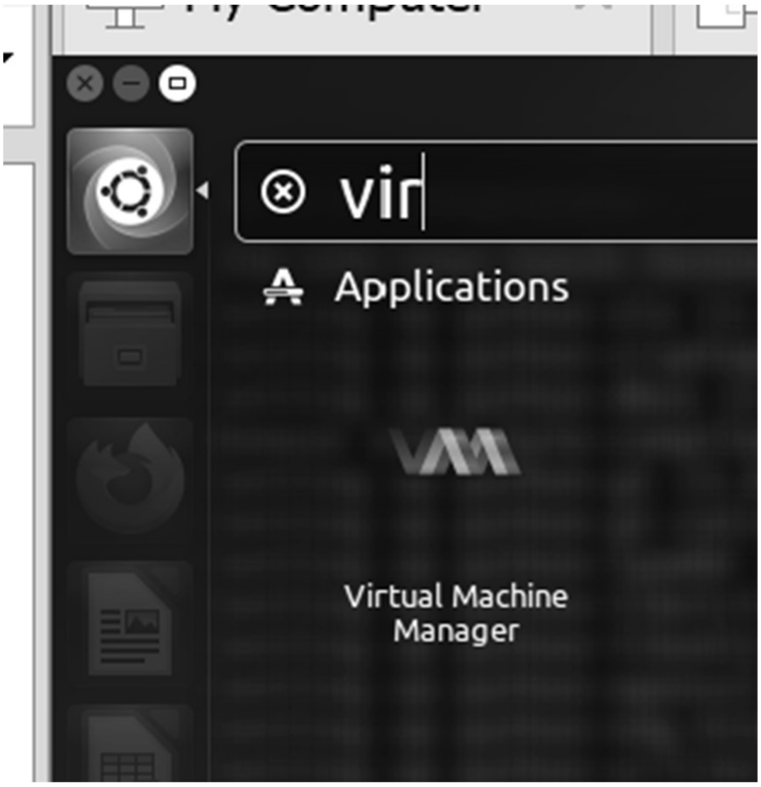
❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **sudo apt-get install qemu-kvm libvirt-bin virt-manager**

② **sudo adduser username libvirt** ## Option

③ **sudo adduser username libvirt-qemu** ## Option

④ **Start Virt-Manager** (as nested hypervisor)

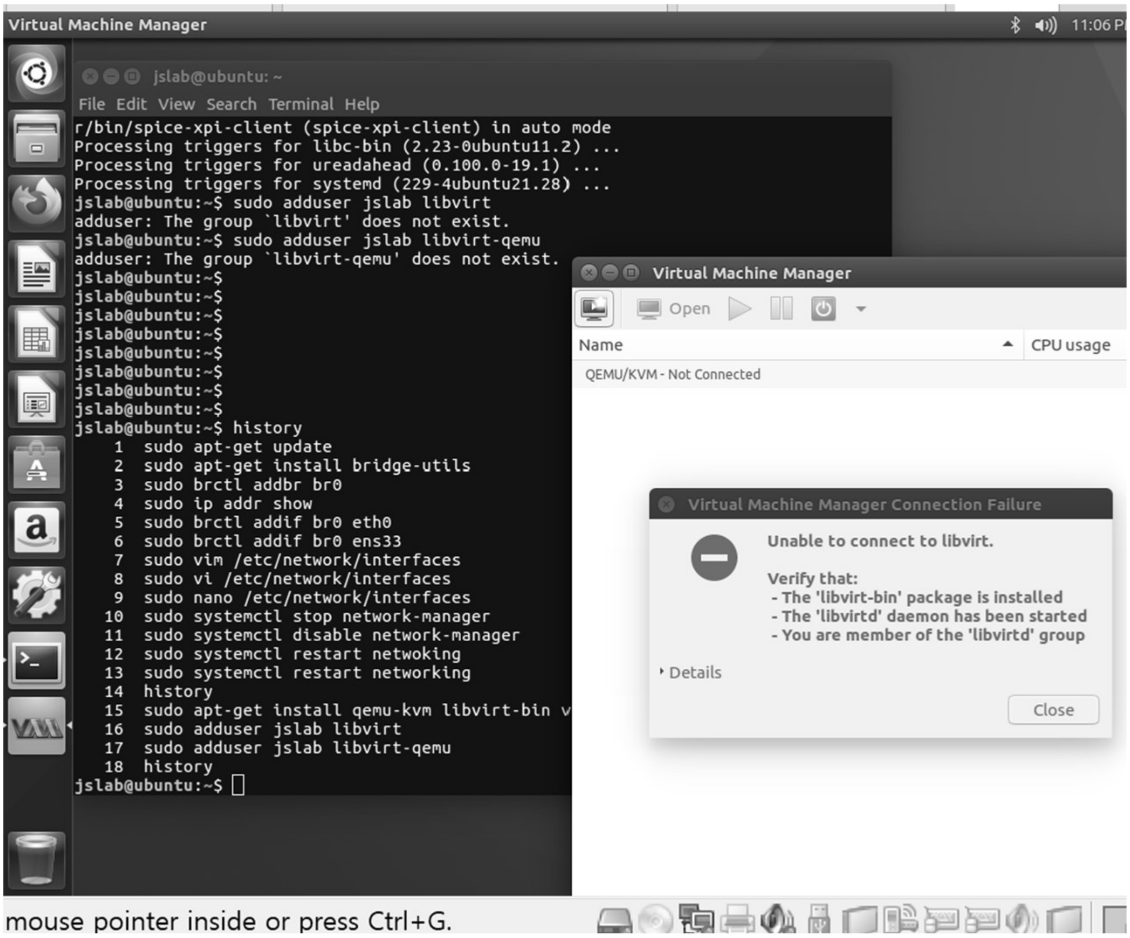


메모:

- Ubuntu에서 KVM 설치 후 하이퍼바이저 ESXi에서 하드웨어 가상화 미설정 확인 후에는 KVM 구동을 위해 **systemctl start libvirtd** 실행

- ❖ **KVM/QEMU** (8 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **sudo apt-get install qemu-kvm libvirt-bin virt-manager**
② **sudo adduser username libvirt** ## Option
③ **sudo adduser username libvirt-qemu** ## Option
④ **Start Virt-Manager** (오류 발생 확인)
⑤ **Reboot**



```
r/bin/spice-xpi-client (spice-xpi-client) in auto mode
Processing triggers for libc-bin (2.23-0ubuntu11.2) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for systemd (229-4ubuntu21.28) ...
jslab@ubuntu:~$ sudo adduser jslab libvirt
adduser: The group `libvirt' does not exist.
jslab@ubuntu:~$ sudo adduser jslab libvirt-qemu
adduser: The group `libvirt-qemu' does not exist.
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$ history
    1  sudo apt-get update
    2  sudo apt-get install bridge-utils
    3  sudo brctl addbr br0
    4  sudo ip addr show
    5  sudo brctl addif br0 eth0
    6  sudo brctl addif br0 ens33
    7  sudo vim /etc/network/interfaces
    8  sudo vi /etc/network/interfaces
    9  sudo nano /etc/network/interfaces
   10  sudo systemctl stop network-manager
   11  sudo systemctl disable network-manager
   12  sudo systemctl restart netwoking
   13  sudo systemctl restart networking
   14  history
   15  sudo apt-get install qemu-kvm libvirt-bin v
   16  sudo adduser jslab libvirt
   17  sudo adduser jslab libvirt-qemu
   18  history
jslab@ubuntu:~$ 
```

Unable to connect to libvirt.

Verify that:
- The 'libvirt-bin' package is installed
- The 'libvirtd' daemon has been started
- You are member of the 'libvirtd' group

mouse pointer inside or press Ctrl+G.

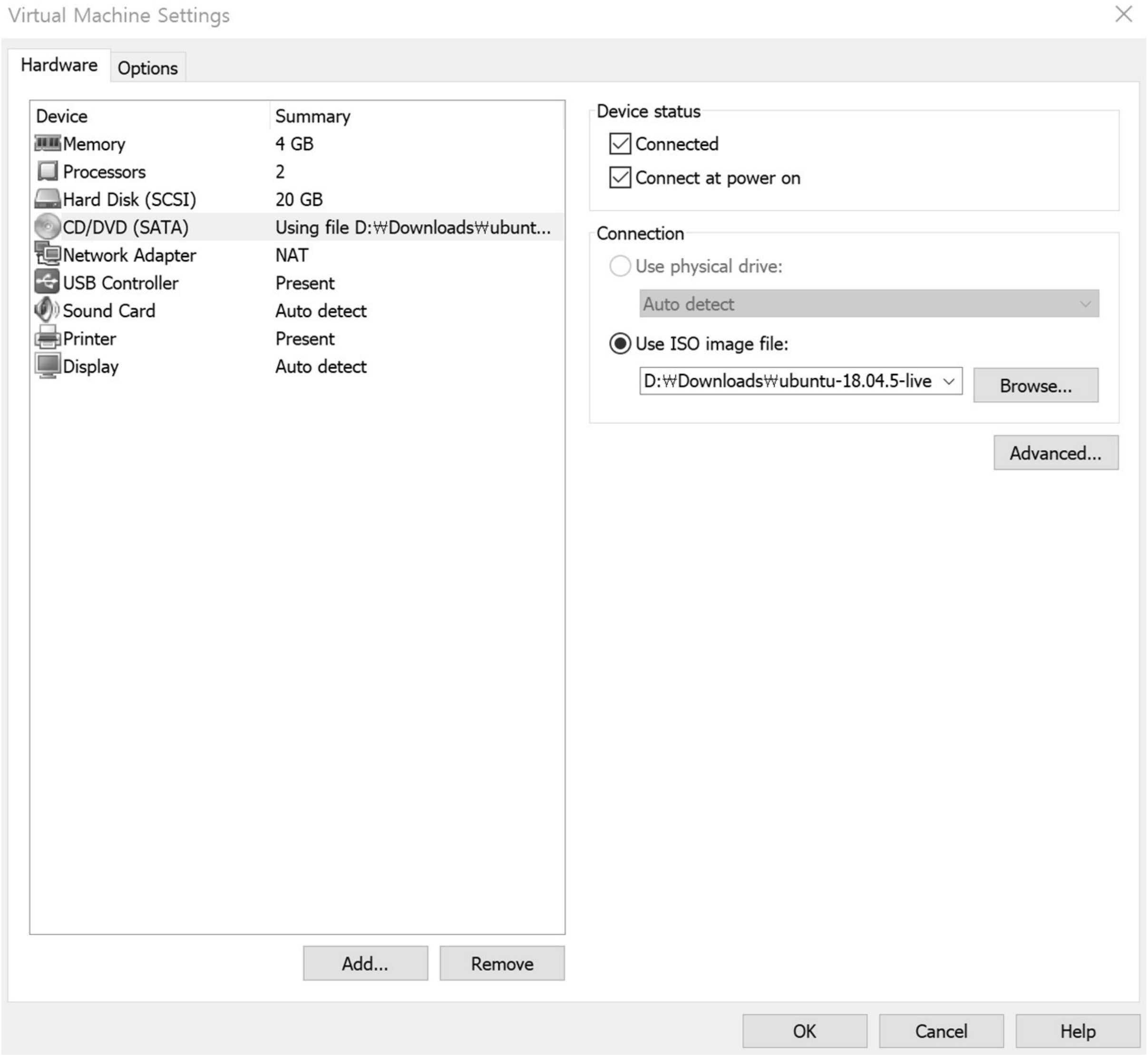
메모:

부록. VMware Lab 운영

- ❖ **KVM/QEMU** (9 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **VM에 ISO file 등록**

② **Connected 확인**



Virtual Machine Settings

Hardware | Options

Device	Summary
Memory	4 GB
Processors	2
Hard Disk (SCSI)	20 GB
CD/DVD (SATA)	Using file D:₩Downloads₩ubunt...
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Device status

☑ Connected

☑ Connect at power on

Connection

○ Use physical drive:

Auto detect

● Use ISO image file:

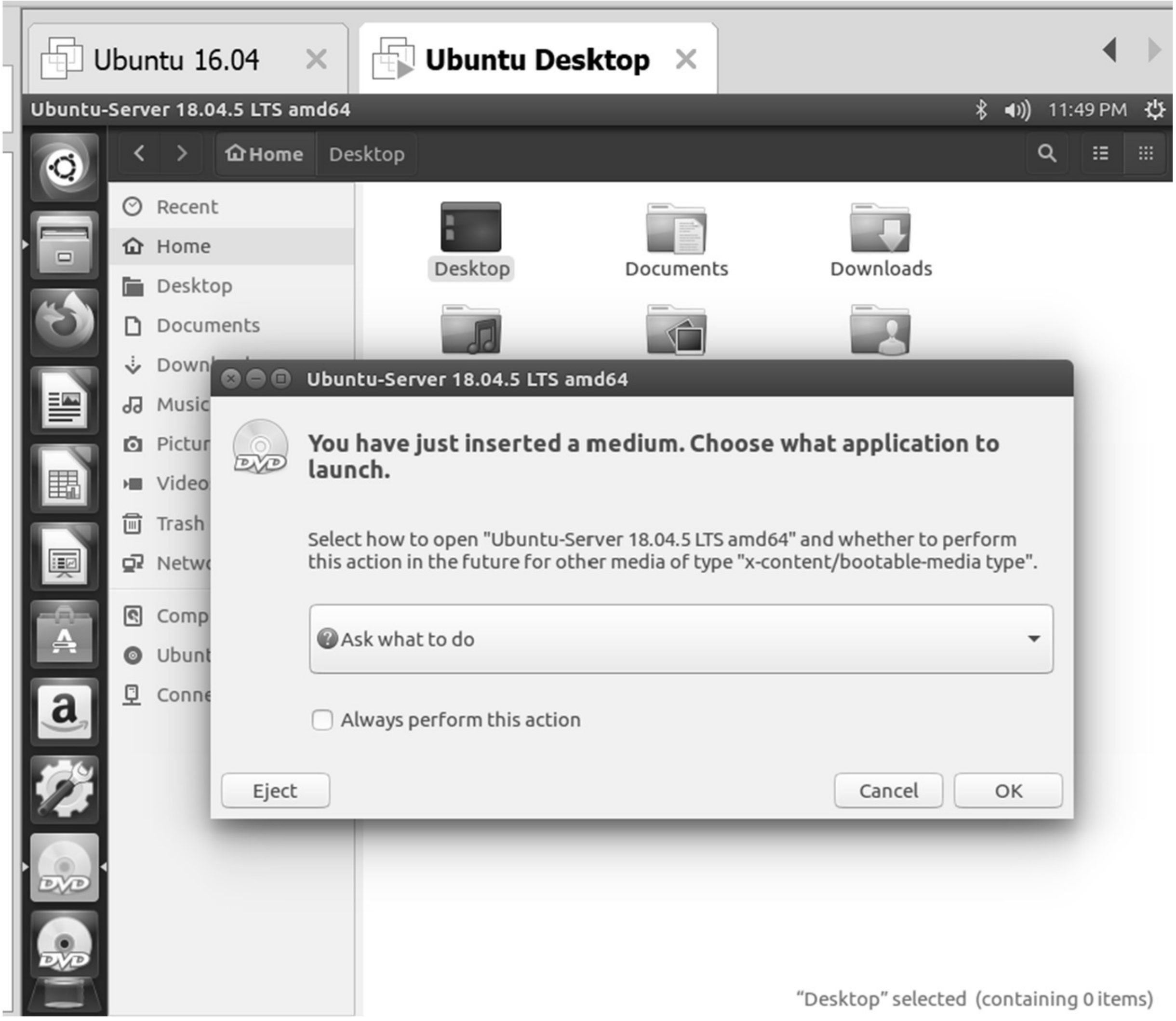
D:₩Downloads₩ubuntu-18.04.5-live

메모:

- ❖ **KVM/QEMU** (10 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **DVD 팝업창 확인**

② **Connected 확인**



Ubuntu-Server 18.04.5 LTS amd64

You have just inserted a medium. Choose what application to launch.

Select how to open "Ubuntu-Server 18.04.5 LTS amd64" and whether to perform this action in the future for other media of type "x-content/bootable-media type".

Ask what to do

☐ Always perform this action

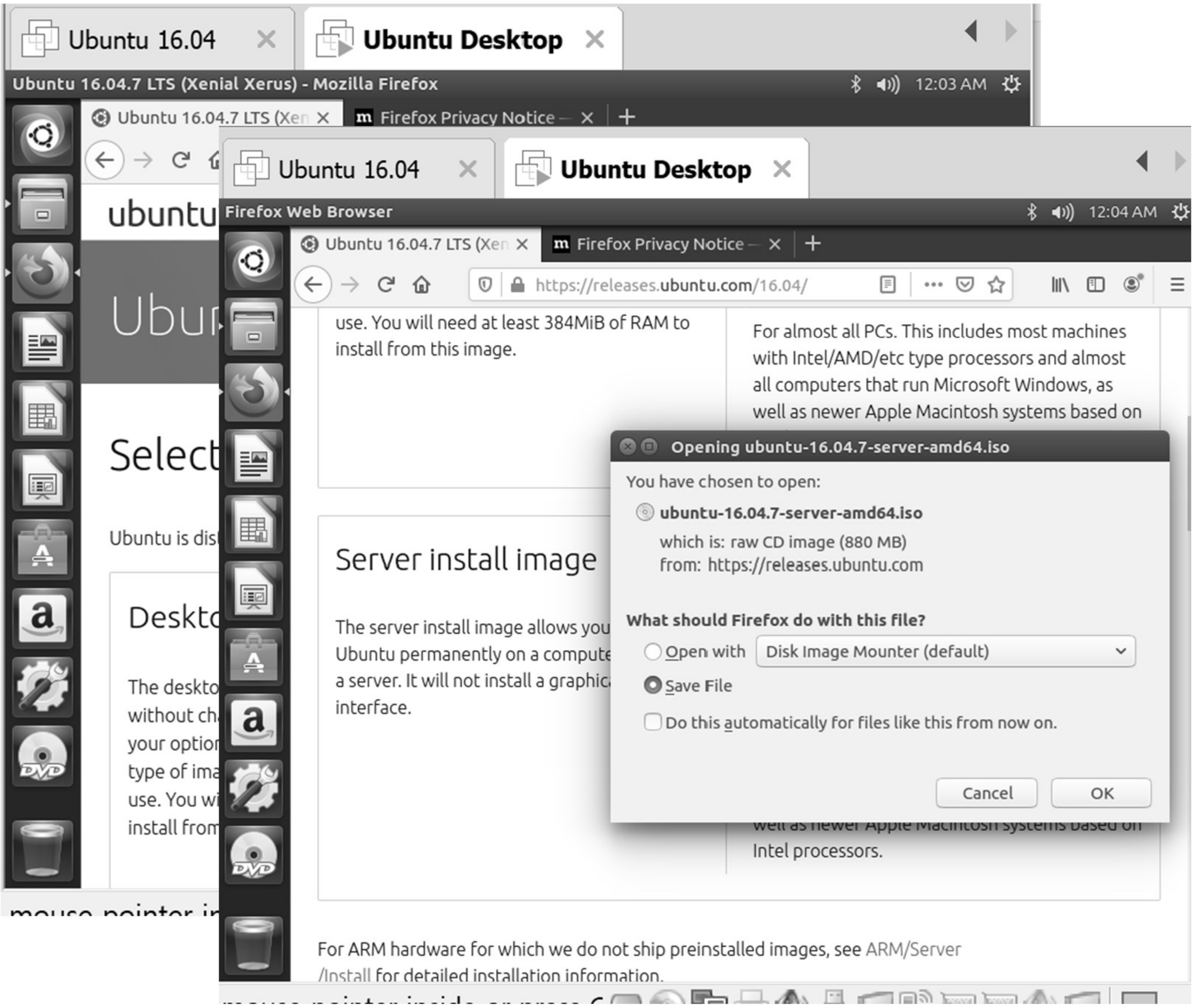
"Desktop" selected (containing 0 items)

메모:

부록. VMware Lab 운영

- ❖ **KVM/QEMU** (11 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① Ubuntu Server OS ISO 파일 DVD 선택



use. You will need at least 384MiB of RAM to install from this image.

For almost all PCs. This includes most machines with Intel/AMD/etc type processors and almost all computers that run Microsoft Windows, as well as newer Apple Macintosh systems based on

Server install image

The server install image allows you Ubuntu permanently on a compute a server. It will not install a graphic interface.

well as newer Apple Macintosh systems based on Intel processors.

For ARM hardware for which we do not ship preinstalled images, see ARM/Server /Install for detailed installation information.

Opening ubuntu-16.04.7-server-amd64.iso

You have chosen to open:

ubuntu-16.04.7-server-amd64.iso

which is: raw CD image (880 MB)
from: https://releases.ubuntu.com

What should Firefox do with this file?

○ Open with Disk Image Mounter (default)

● Save File

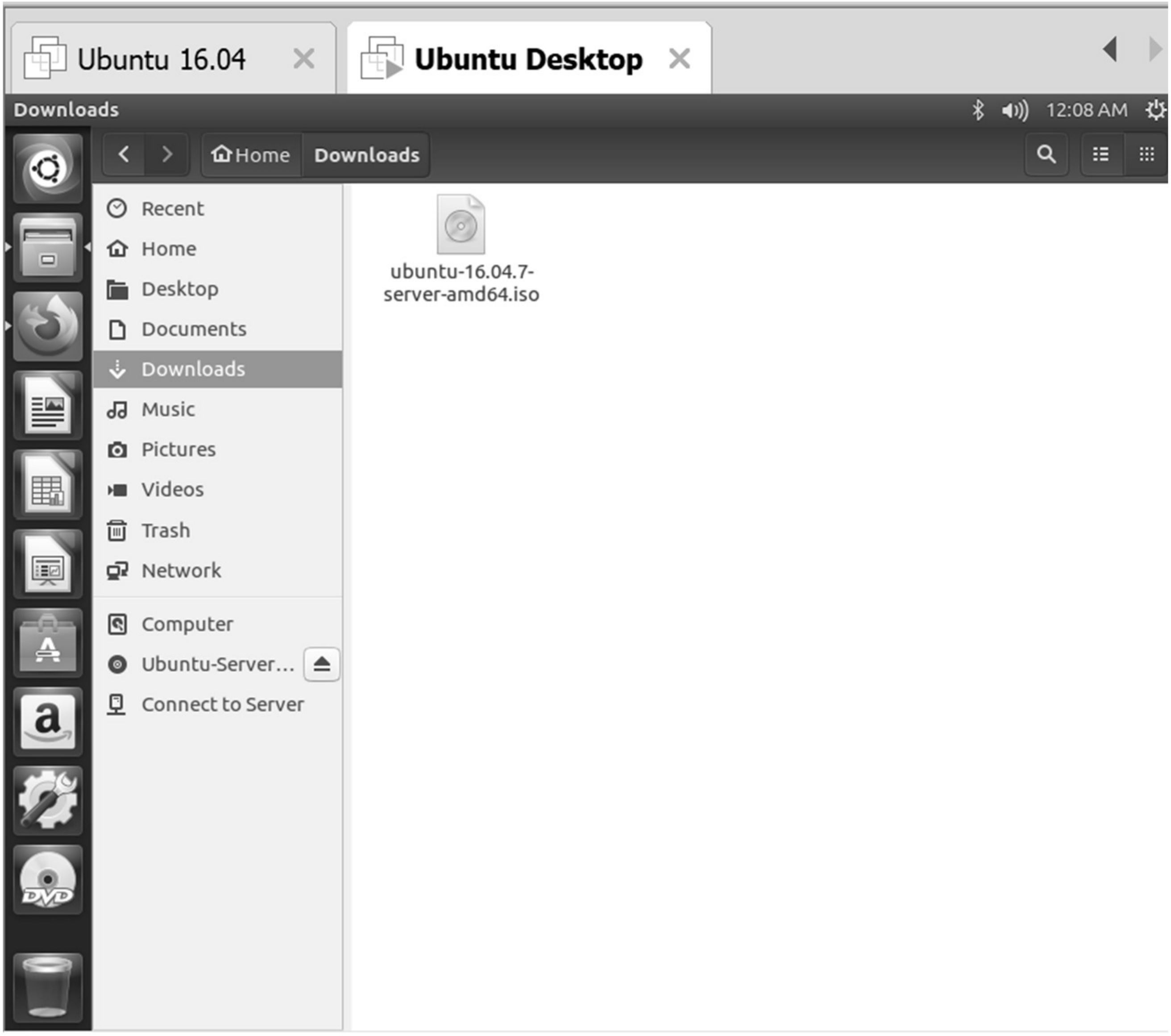
□ Do this automatically for files like this from now on.

Cancel OK

메모:

- **KVM/QEMU** (12 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

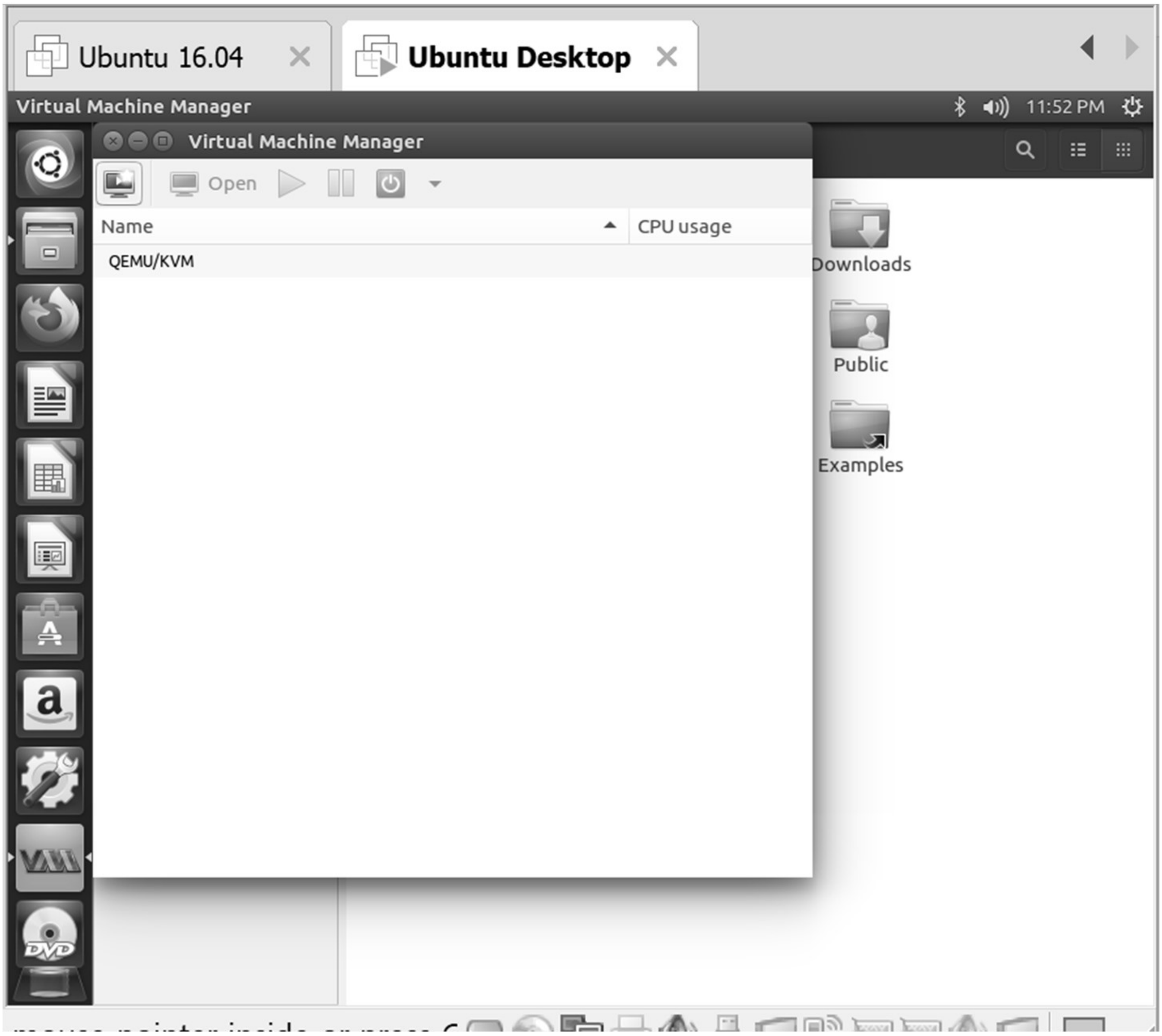
① **Downloads 폴더 확인**



메모:

- **KVM/QEMU** (13 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

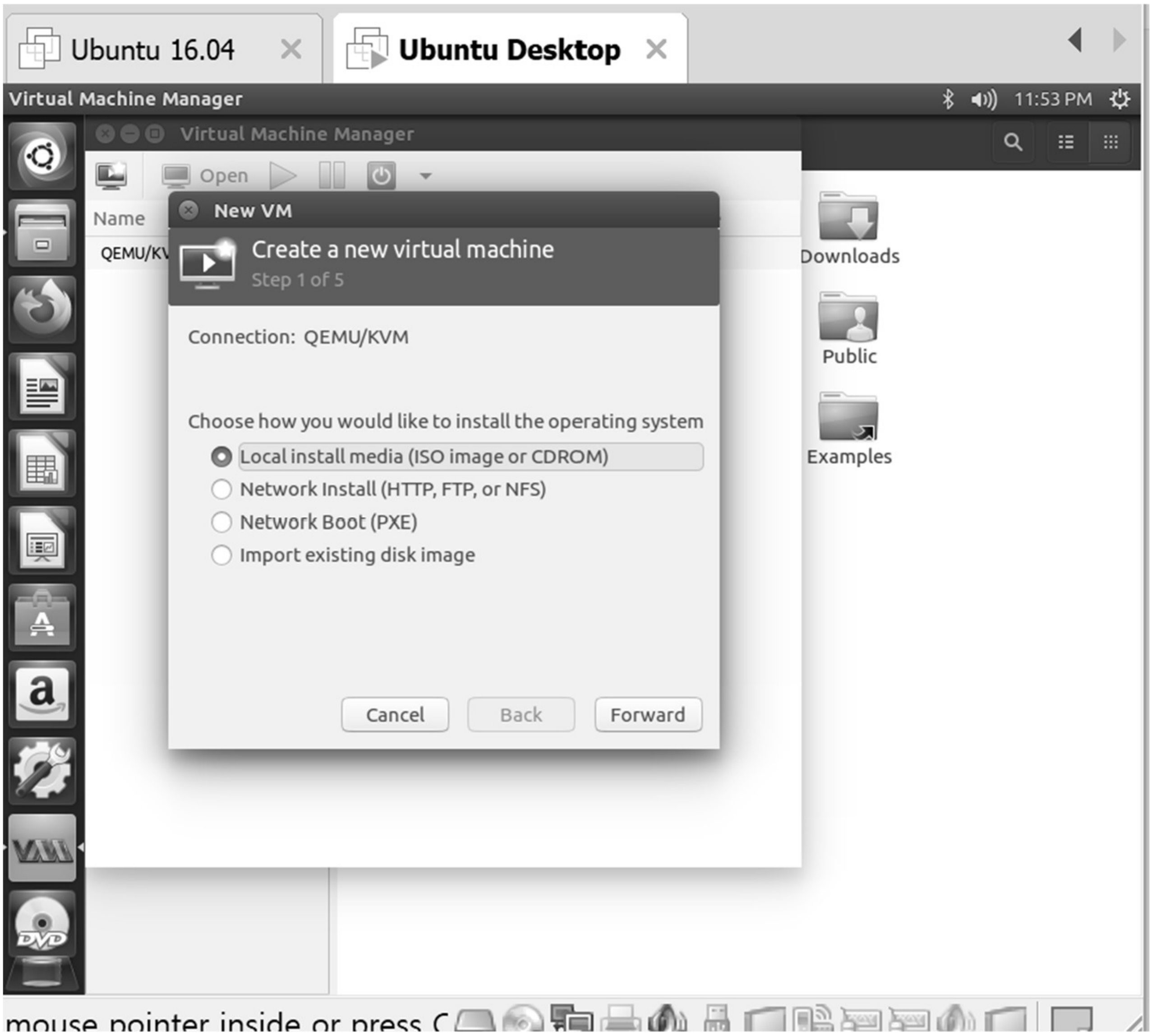
① **Virtual Machine Manager 실행**



메모:

- ❖ **KVM/QEMU** (14 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **새 VM 생성 실행**



New VM

Create a new virtual machine

Step 1 of 5

Connection: QEMU/KVM

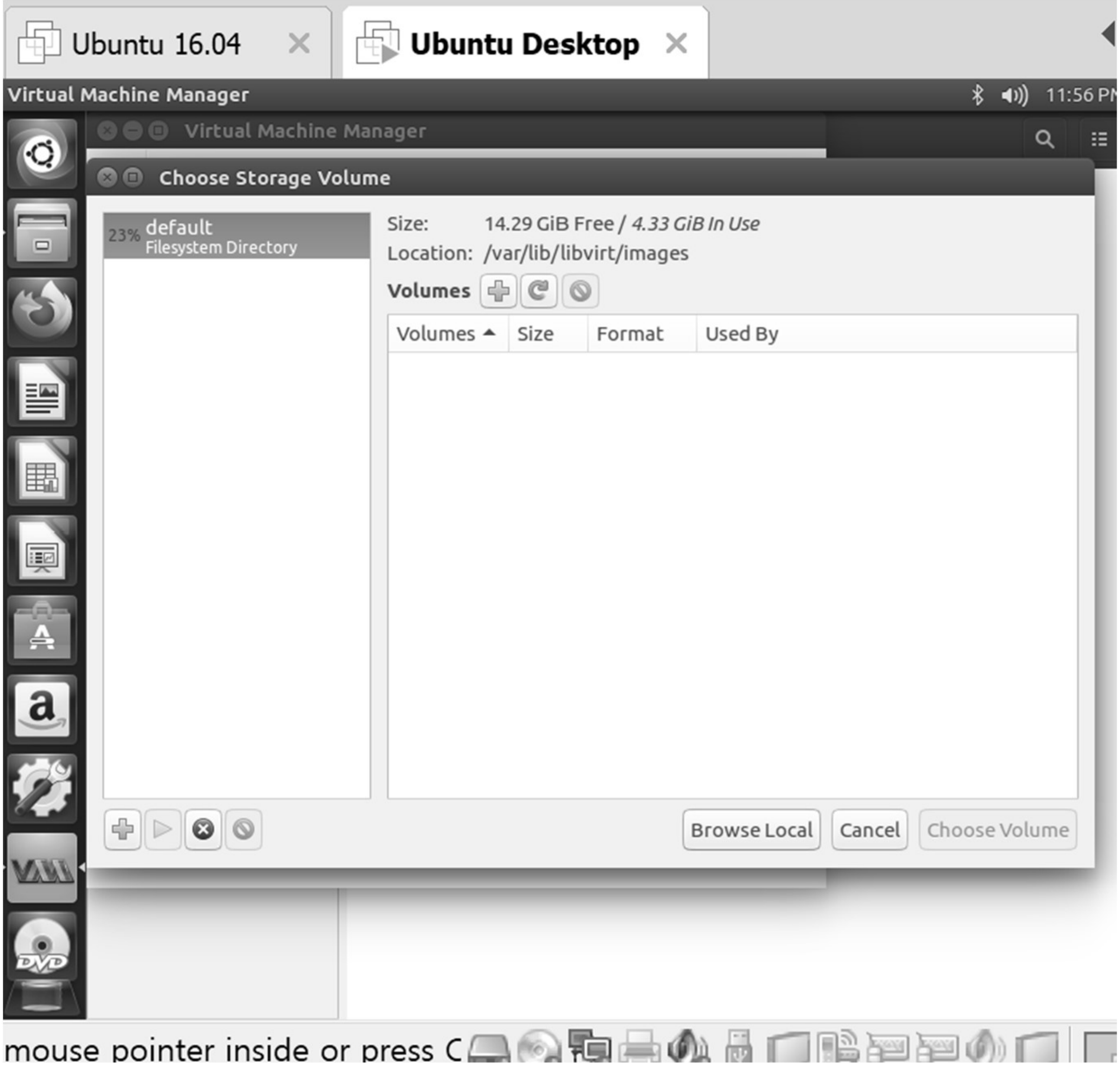
Choose how you would like to install the operating system

- ● Local install media (ISO image or CDROM)
- ○ Network Install (HTTP, FTP, or NFS)
- ○ Network Boot (PXE)
- ○ Import existing disk image

메모:

- ❖ **KVM/QEMU** (15 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Browse Local 선택**



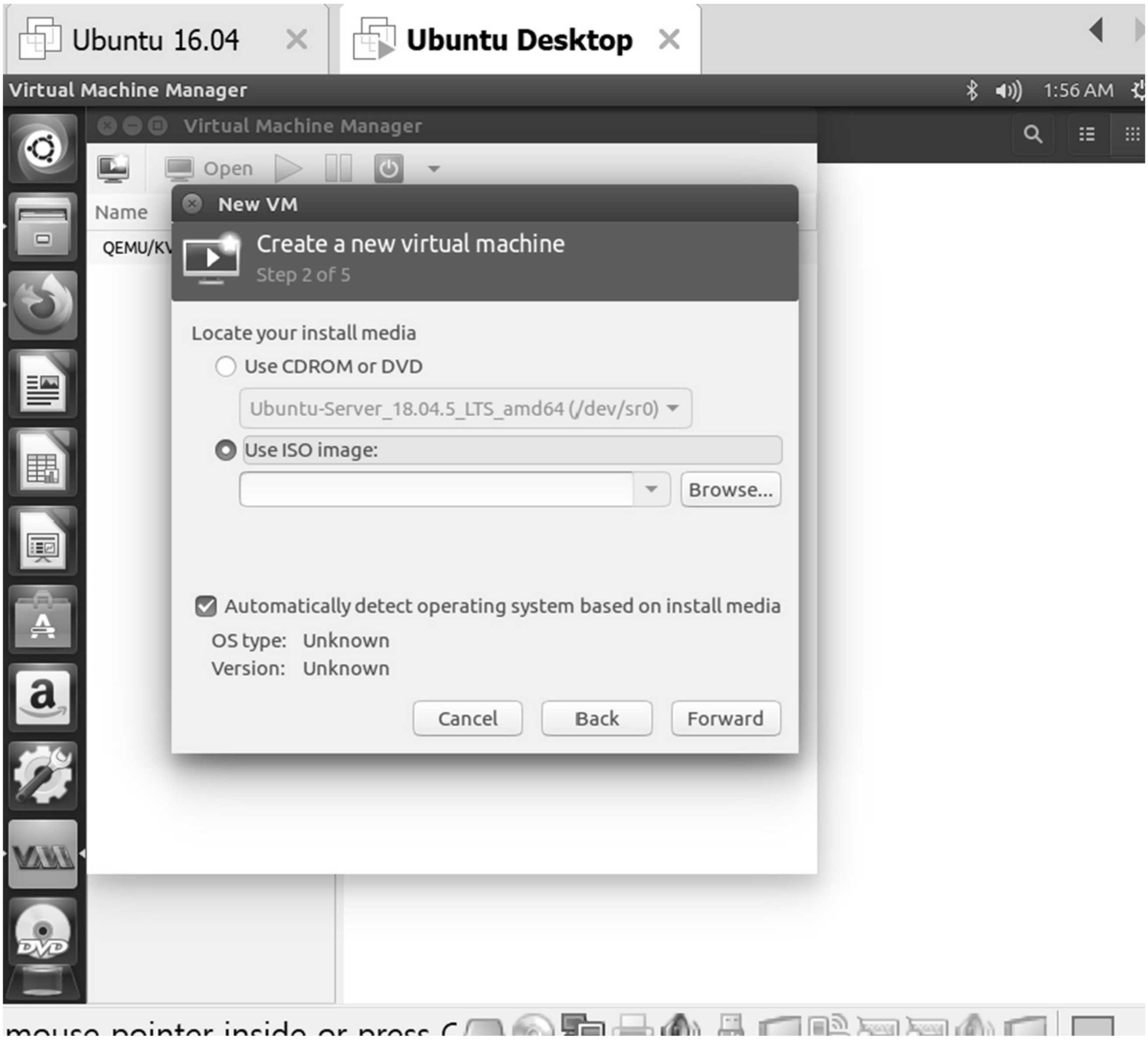
Size: 14.29 GiB Free / *4.33 GiB In Use*

Location: /var/lib/libvirt/images

메모:

- **KVM/QEMU** (16 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Use ISO Image 선택**



New VM

Create a new virtual machine
Step 2 of 5

Locate your install media

○ Use CDROM or DVD

Ubuntu-Server_18.04.5_LTS_amd64 (/dev/sr0)

● Use ISO image:

Browse...

☑ Automatically detect operating system based on install media

OS type: Unknown
Version: Unknown

Cancel Back Forward

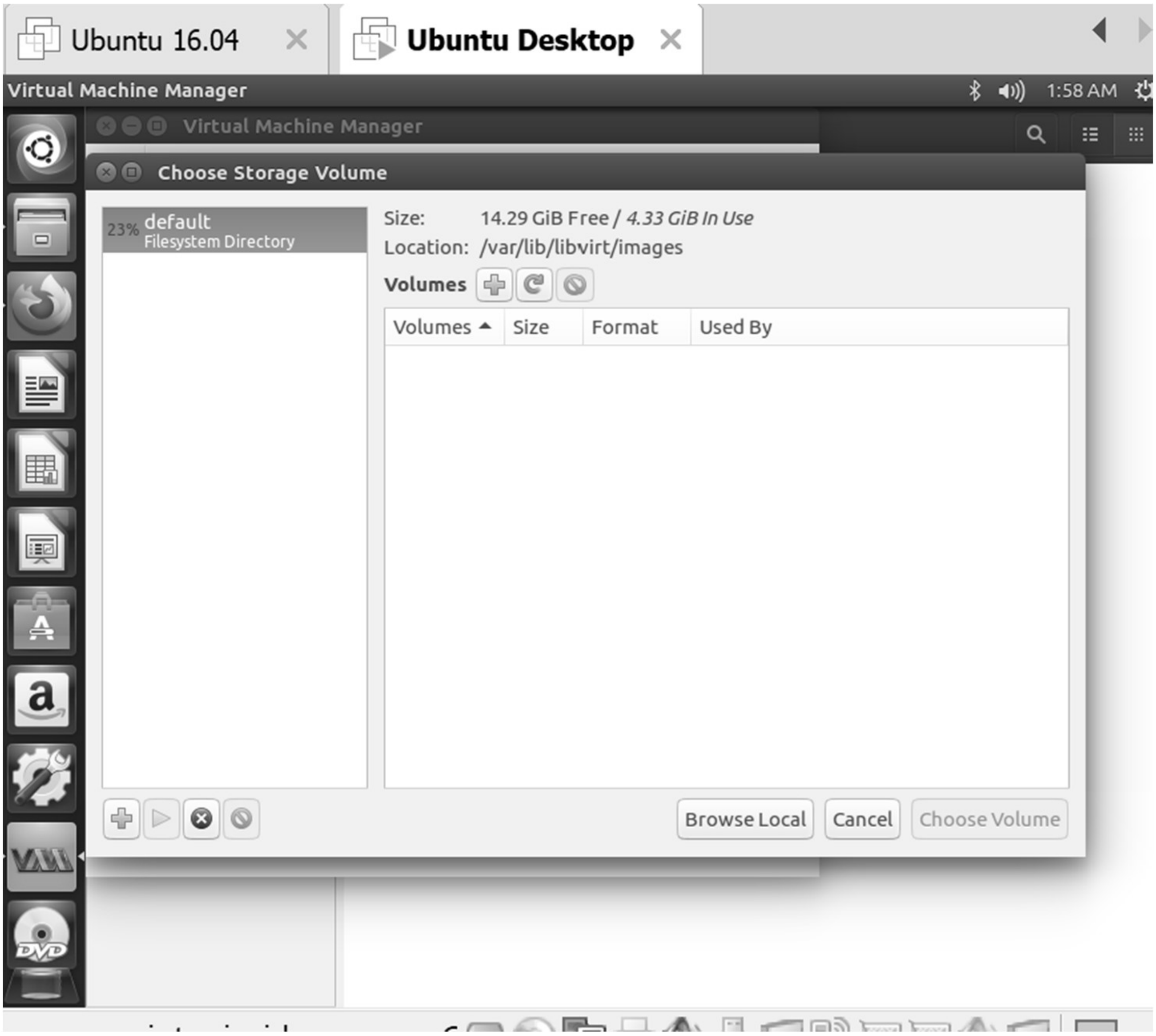
메모:

부록. VMware Lab 운영

❖ **KVM/QEMU** (17 of 29)

❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Brouse Local 선택**



23% default
Filesystem Directory

Size: 14.29 GiB Free / *4.33 GiB In Use*

Location: /var/lib/libvirt/images

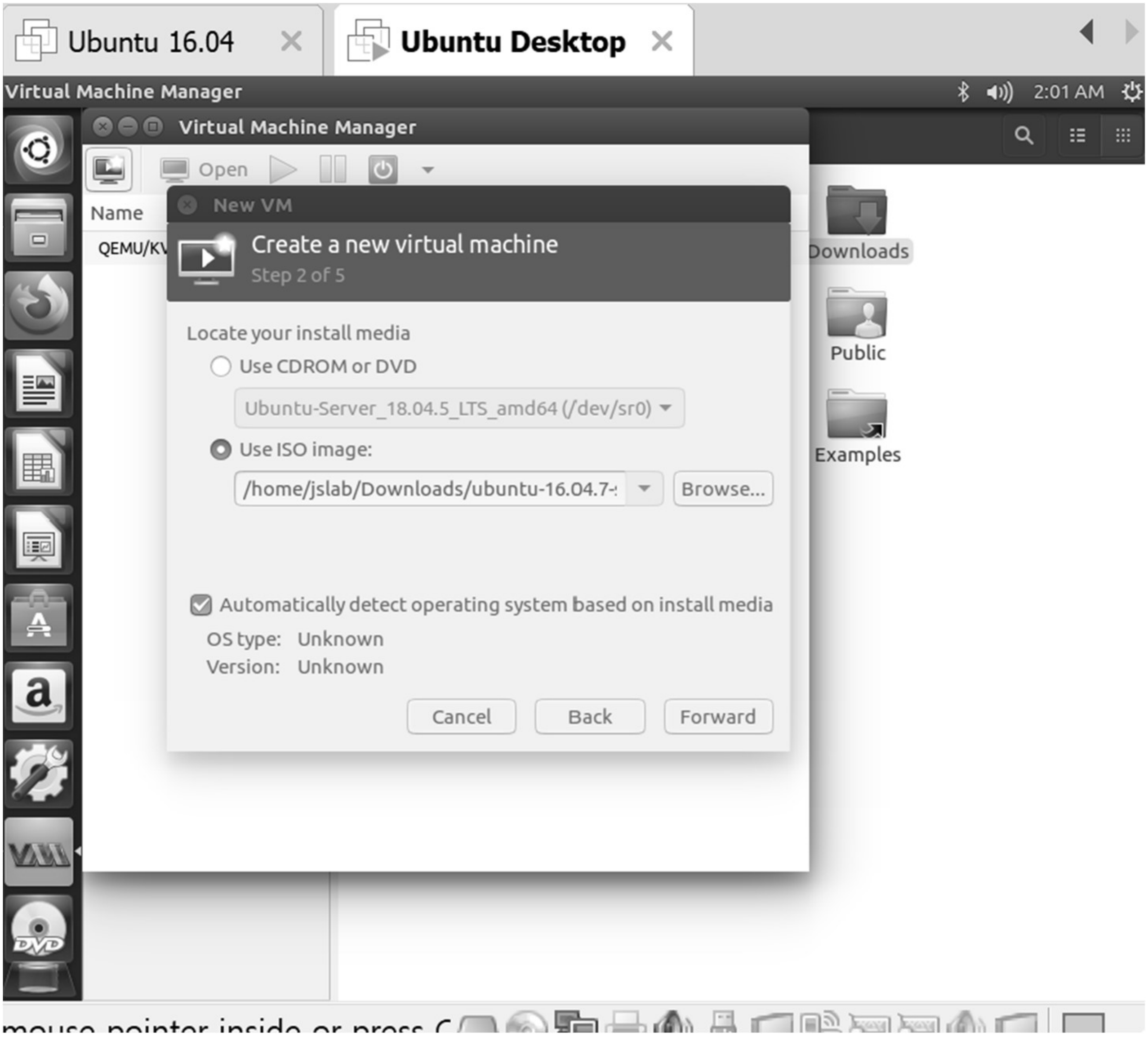
Volumes

Volumes ▲	Size	Format	Used By

메모:

- **KVM/QEMU** (18 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Ubuntu Server 16.04 ISO Image 선택**



Create a new virtual machine
Step 2 of 5

Locate your install media

○ Use CDROM or DVD

Ubuntu-Server_18.04.5_LTS_amd64 (/dev/sr0)

● Use ISO image:

/home/jslab/Downloads/ubuntu-16.04.7-

Browse...

☑ Automatically detect operating system based on install media

OS type: Unknown

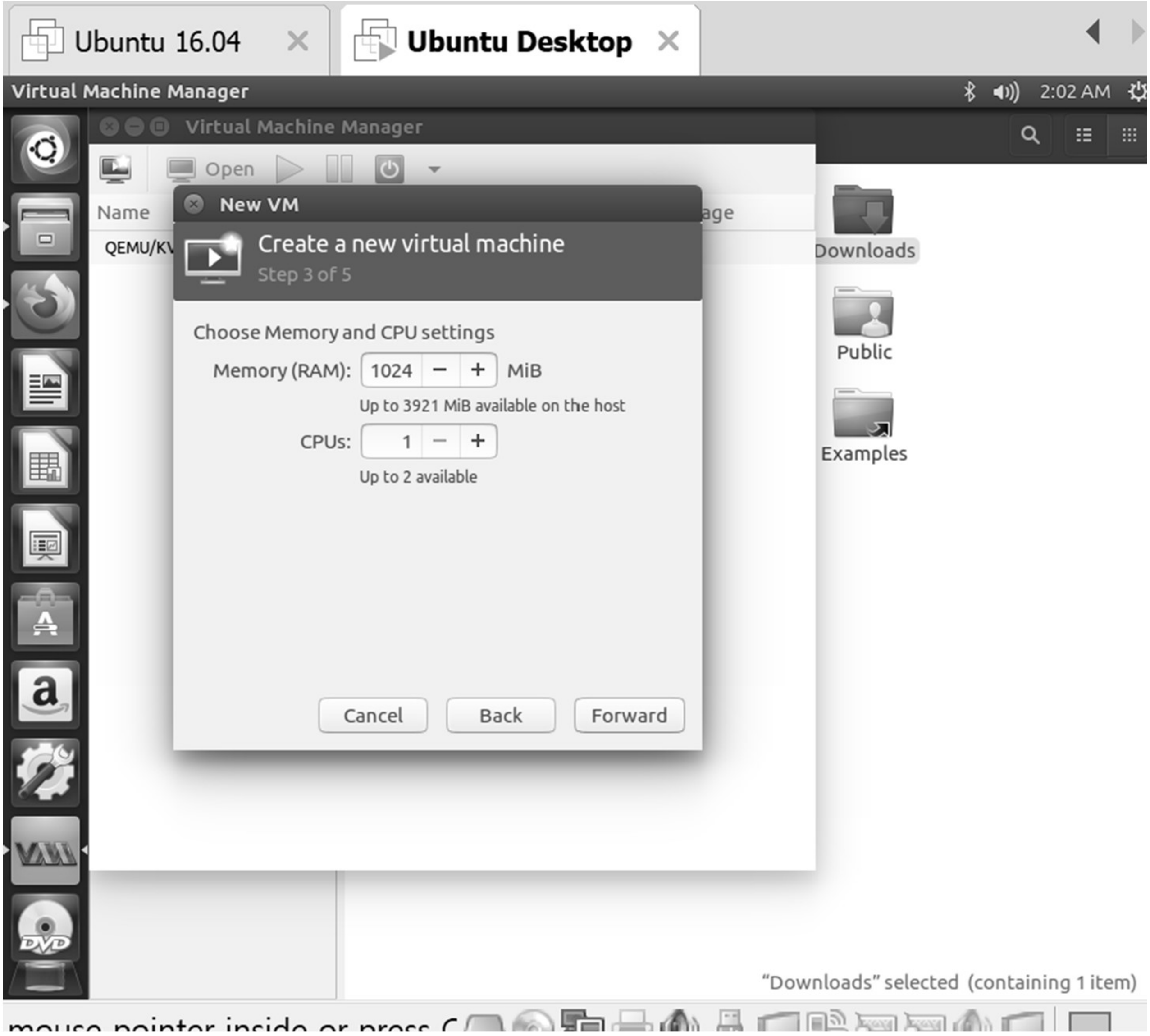
Version: Unknown

Cancel Back Forward

메모:

- ❖ **KVM/QEMU** (19 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① RAM, CPU 설정



New VM

Create a new virtual machine
Step 3 of 5

Choose Memory and CPU settings

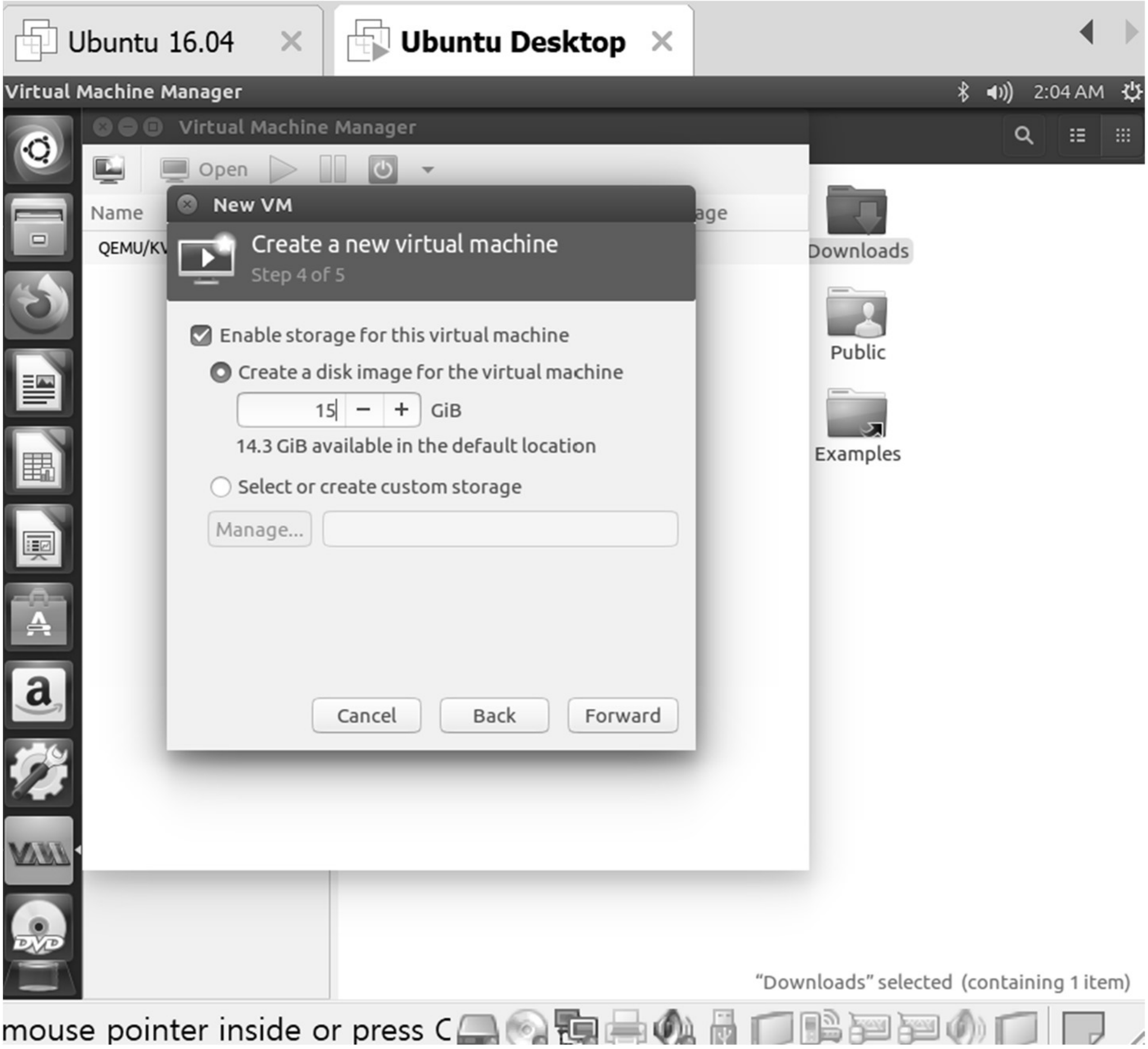
Memory (RAM): 1024 MiB
Up to 3921 MiB available on the host

CPUs: 1
Up to 2 available

메모:

- ❖ **KVM/QEMU** (20 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Storage 설정**



New VM

Create a new virtual machine
Step 4 of 5

☑ Enable storage for this virtual machine

● Create a disk image for the virtual machine

15 GiB

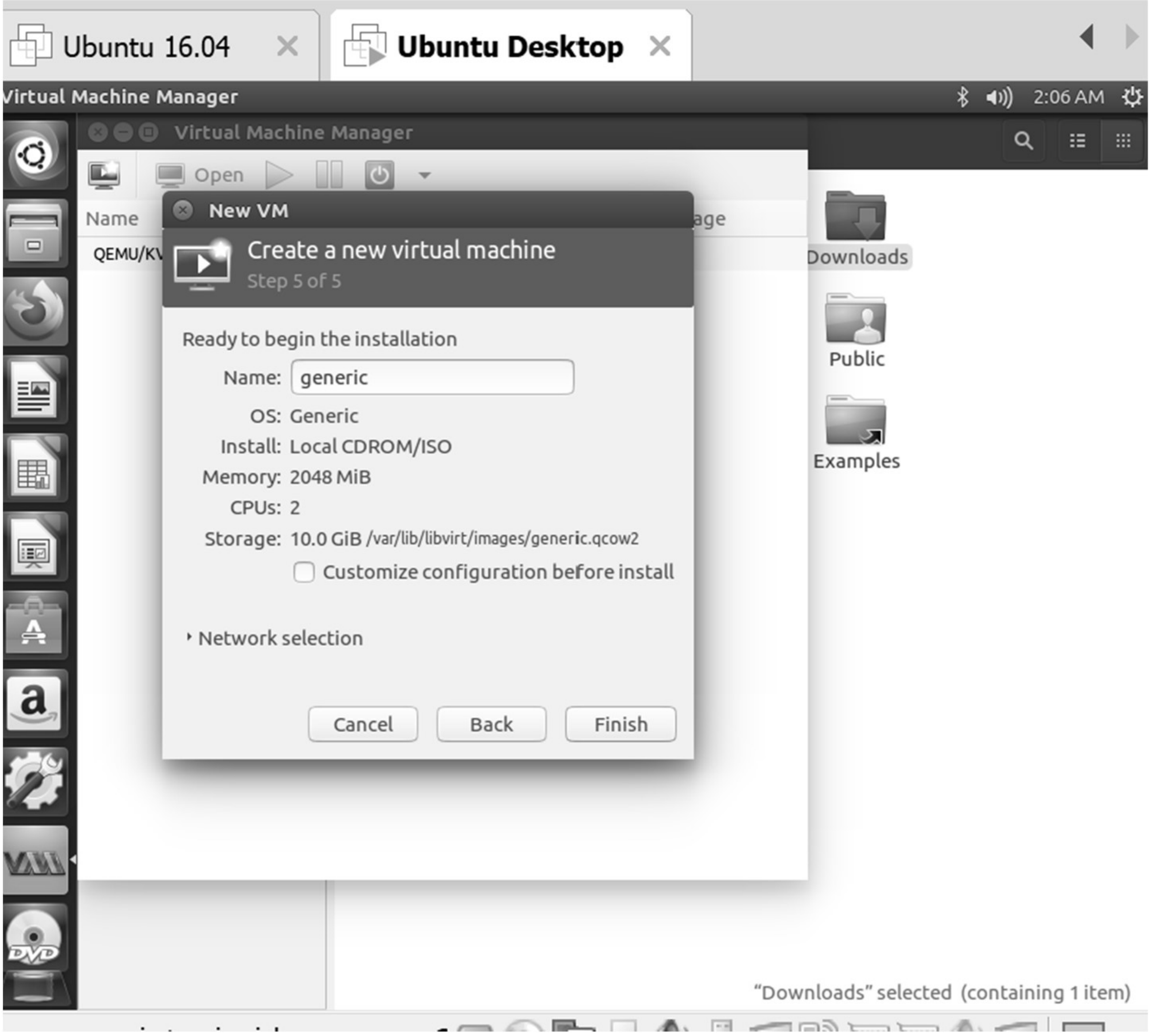
14.3 GiB available in the default location

○ Select or create custom storage

메모:

- **KVM/QEMU** (21 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Finish 선택**



New VM

Create a new virtual machine

Step 5 of 5

Ready to begin the installation

Name: generic

OS: Generic

Install: Local CDROM/ISO

Memory: 2048 MiB

CPUs: 2

Storage: 10.0 GiB /var/lib/libvirt/images/generic.qcow2

□ Customize configuration before install

‣ Network selection

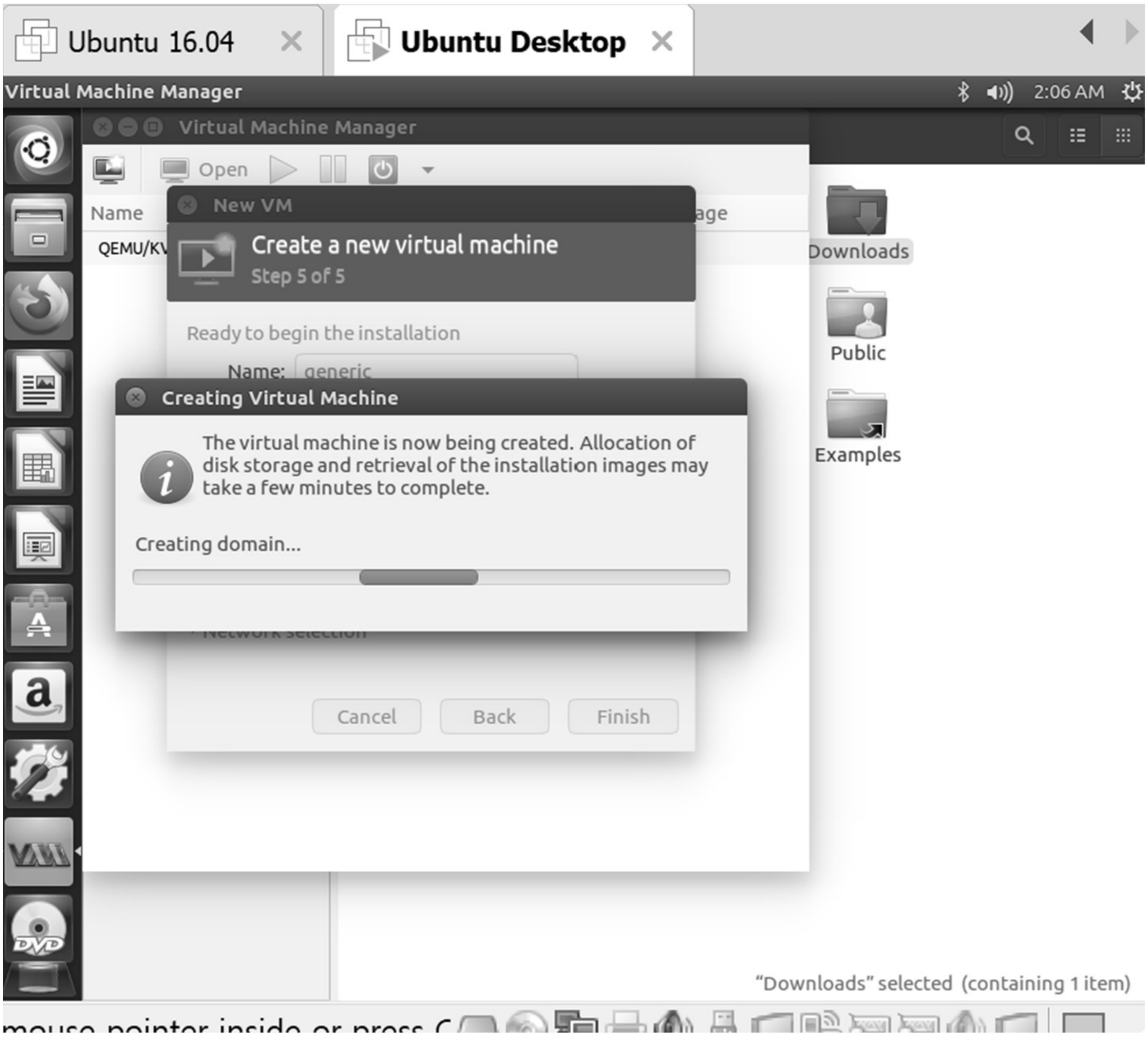
"Downloads" selected (containing 1 item)

메모:

❖ **KVM/QEMU** (22 of 29)

❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Installation**



New VM

Create a new virtual machine

Step 5 of 5

Ready to begin the installation

Name: generic

Creating Virtual Machine

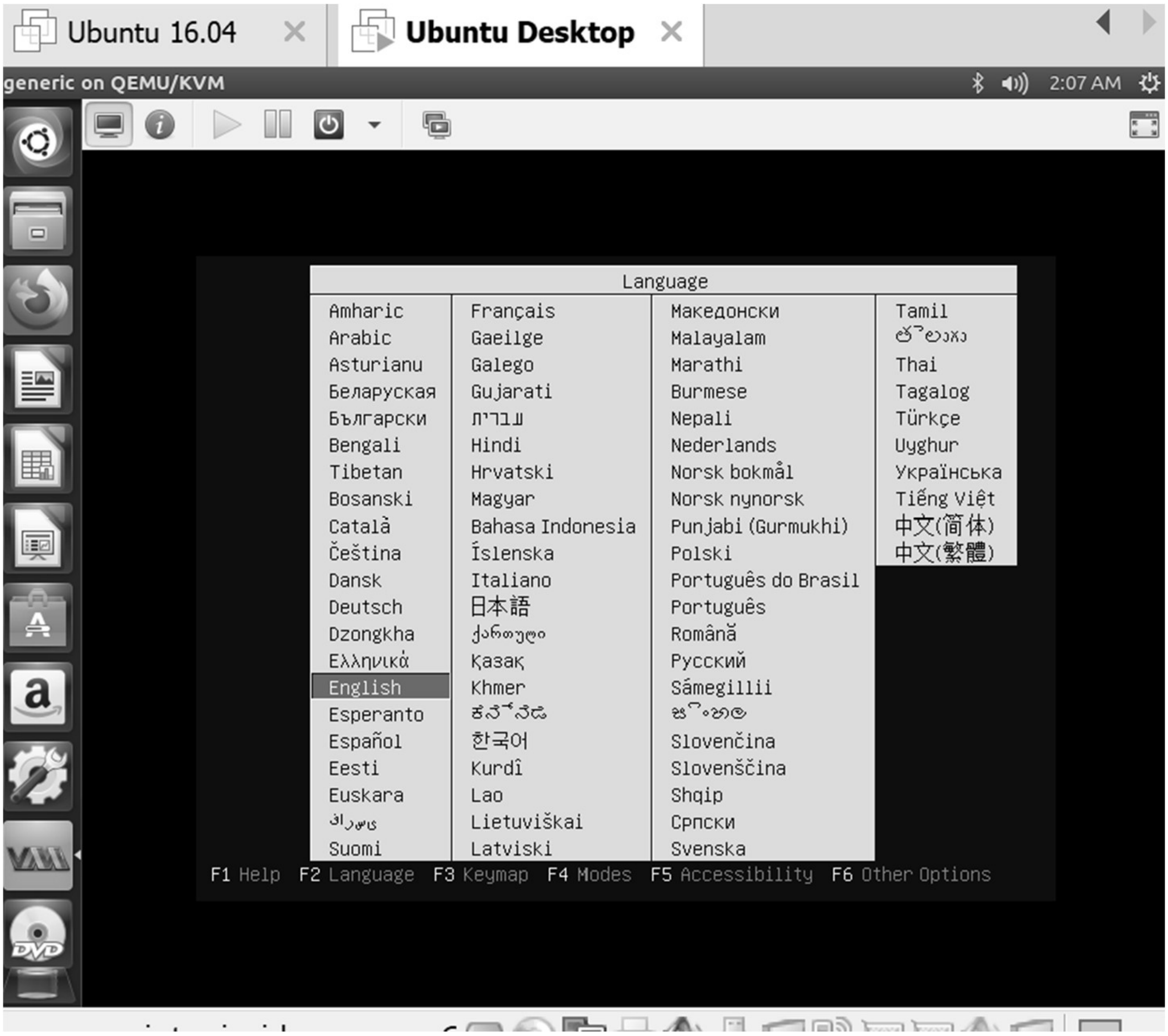
The virtual machine is now being created. Allocation of disk storage and retrieval of the installation images may take a few minutes to complete.

Creating domain...

메모:

- **KVM/QEMU** (23 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Use ISO Image 선택**

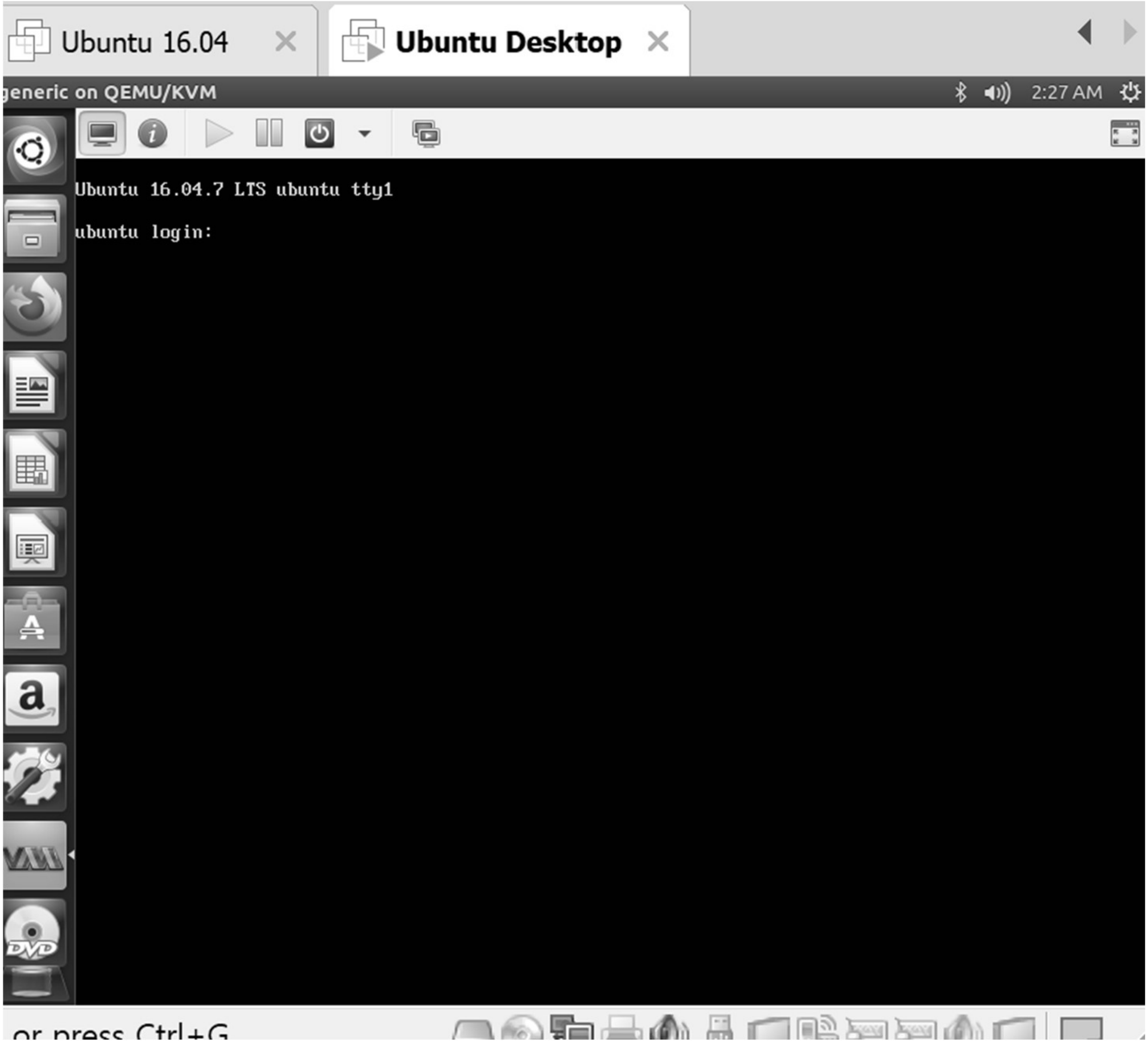


메모:

❖ **KVM/QEMU** (24 of 29)

❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Ubuntu Server 16.04 설치 후 리부팅한 화면**



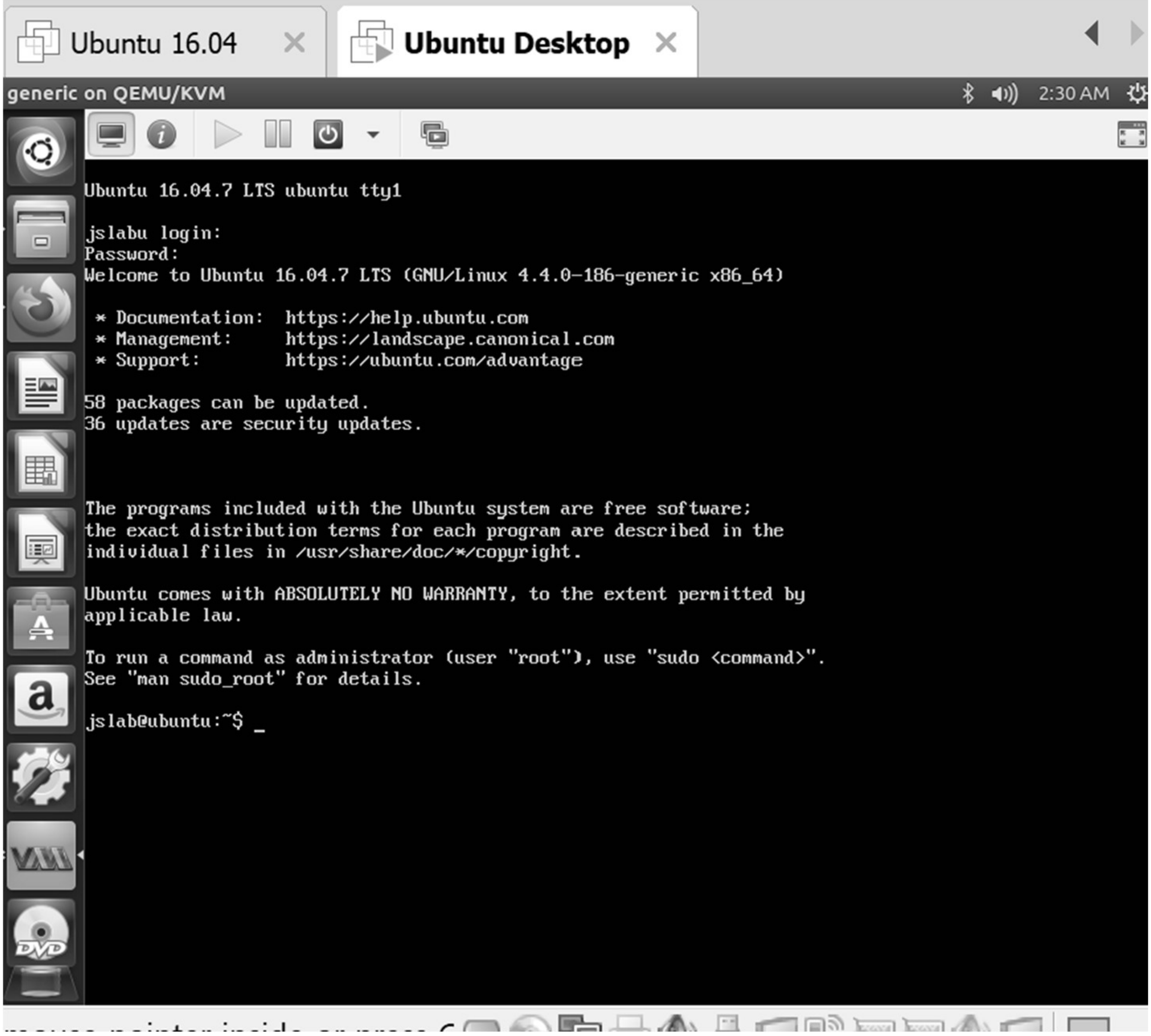
```
Ubuntu 16.04.7 LTS ubuntu tty1

ubuntu login:
```

메모:

부록. VMware Lab 운영

- **KVM/QEMU** (25 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Ubuntu Server 16.04 설치 후 리부팅한 화면**



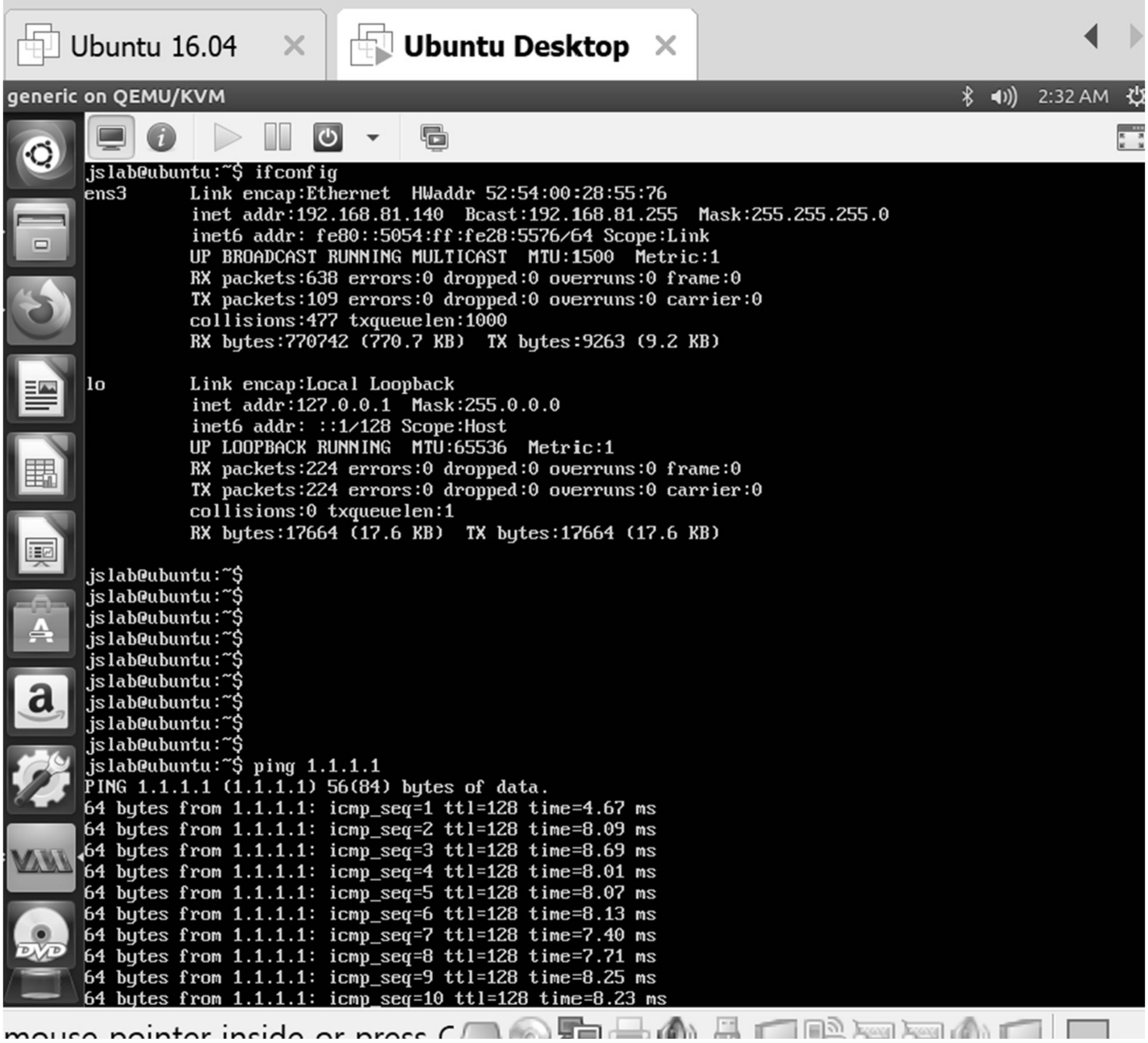
```
Ubuntu 16.04.7 LTS ubuntu tty1

jslabu login:
Password:
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.4.0-186-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

58 packages can be updated.
36 updates are security updates.



The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

jslab@ubuntu:~$ _
```

메모:

부록. VMware Lab 운영

- **KVM/QEMU** (26 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① **Ubuntu Server 16.04 인터페이스 확인** (ifconfig)
② **외부 연결 Ping 실행** (ping 1.1.1.1)

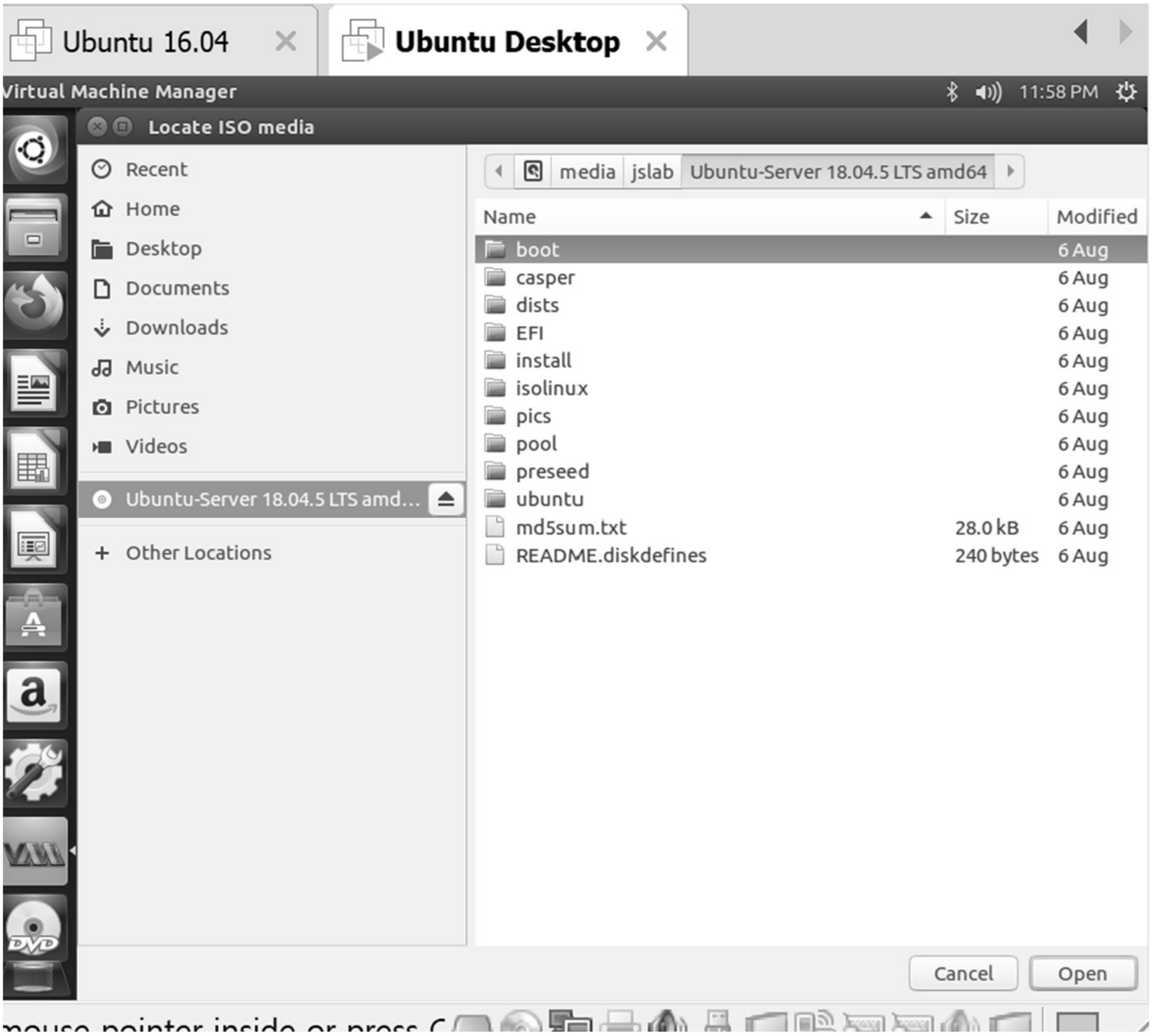


```
jslab@ubuntu:~$ ifconfig
ens3      Link encap:Ethernet  HWaddr 52:54:00:28:55:76
          inet addr:192.168.81.140  Bcast:192.168.81.255  Mask:255.255.255.0
          inet6 addr: fe80::5054:ff:fe28:5576/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:638 errors:0 dropped:0 overruns:0 frame:0
          TX packets:109 errors:0 dropped:0 overruns:0 carrier:0
          collisions:477 txqueuelen:1000
          RX bytes:770742 (770.7 KB)  TX bytes:9263 (9.2 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:224 errors:0 dropped:0 overruns:0 frame:0
          TX packets:224 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:17664 (17.6 KB)  TX bytes:17664 (17.6 KB)

jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$ ping 1.1.1.1
PING 1.1.1.1 (1.1.1.1) 56(84) bytes of data.
64 bytes from 1.1.1.1: icmp_seq=1 ttl=128 time=4.67 ms
64 bytes from 1.1.1.1: icmp_seq=2 ttl=128 time=8.09 ms
64 bytes from 1.1.1.1: icmp_seq=3 ttl=128 time=8.69 ms
64 bytes from 1.1.1.1: icmp_seq=4 ttl=128 time=8.01 ms
64 bytes from 1.1.1.1: icmp_seq=5 ttl=128 time=8.07 ms
64 bytes from 1.1.1.1: icmp_seq=6 ttl=128 time=8.13 ms
64 bytes from 1.1.1.1: icmp_seq=7 ttl=128 time=7.40 ms
64 bytes from 1.1.1.1: icmp_seq=8 ttl=128 time=7.71 ms
64 bytes from 1.1.1.1: icmp_seq=9 ttl=128 time=8.25 ms
64 bytes from 1.1.1.1: icmp_seq=10 ttl=128 time=8.23 ms
```

메모:

- ❖ **KVM/QEMU** (27 of 29)
- ❖ **Ubuntu Desktop 16.04 Installation (KVM)**

① **Ubuntu Server OS ISO 파일 DVD 선택**



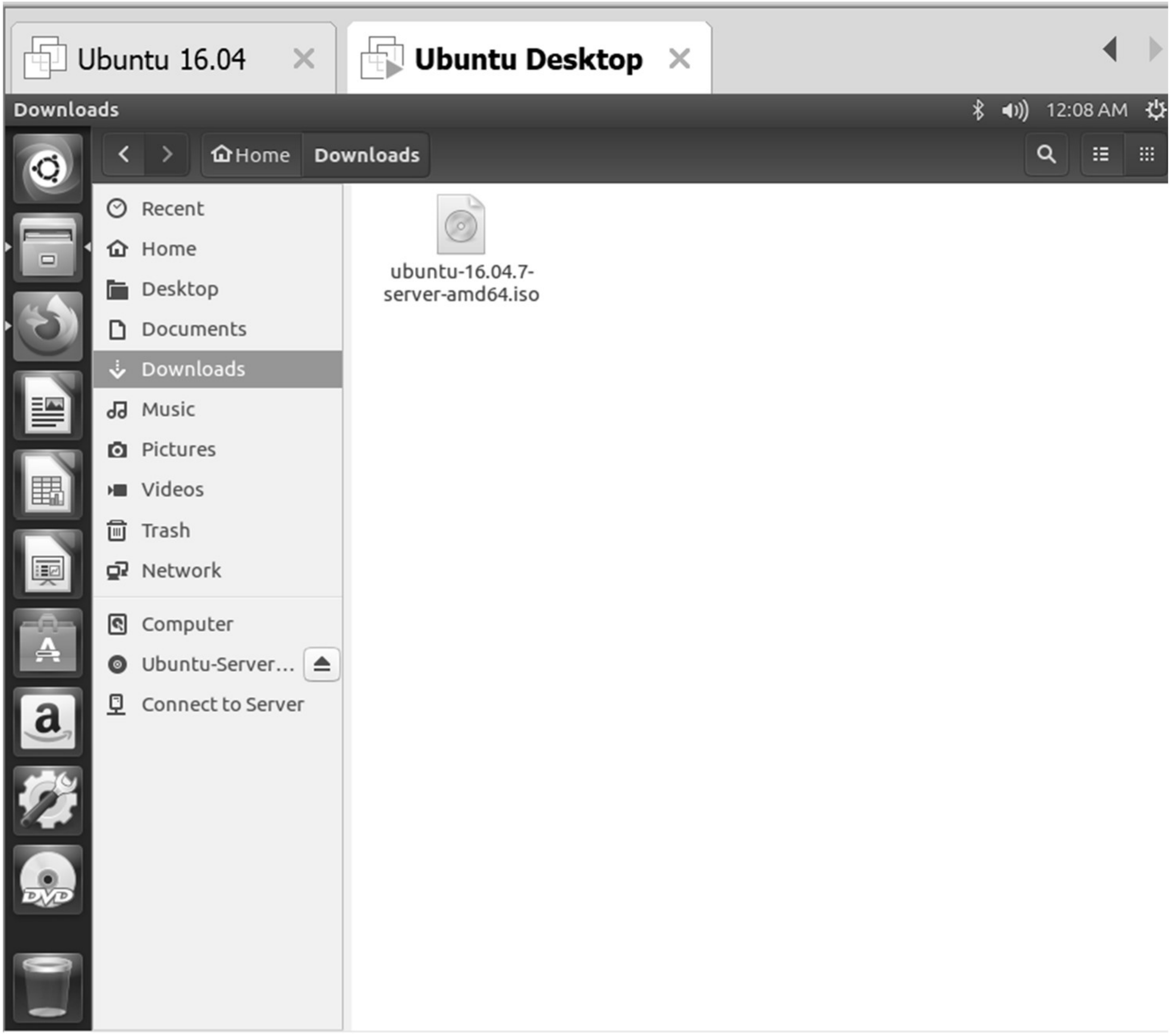
Name	Size	Modified
boot		6 Aug
casper		6 Aug
dists		6 Aug
EFI		6 Aug
install		6 Aug
isolinux		6 Aug
pics		6 Aug
pool		6 Aug
preseed		6 Aug
ubuntu		6 Aug
md5sum.txt	28.0 kB	6 Aug
README.diskdefines	240 bytes	6 Aug

메모:

부록. VMware Lab 운영

- **KVM/QEMU** (28 of 29)
- **Ubuntu Desktop 16.04 Installation (KVM)**

① Downloads 폴더 확인



메모:

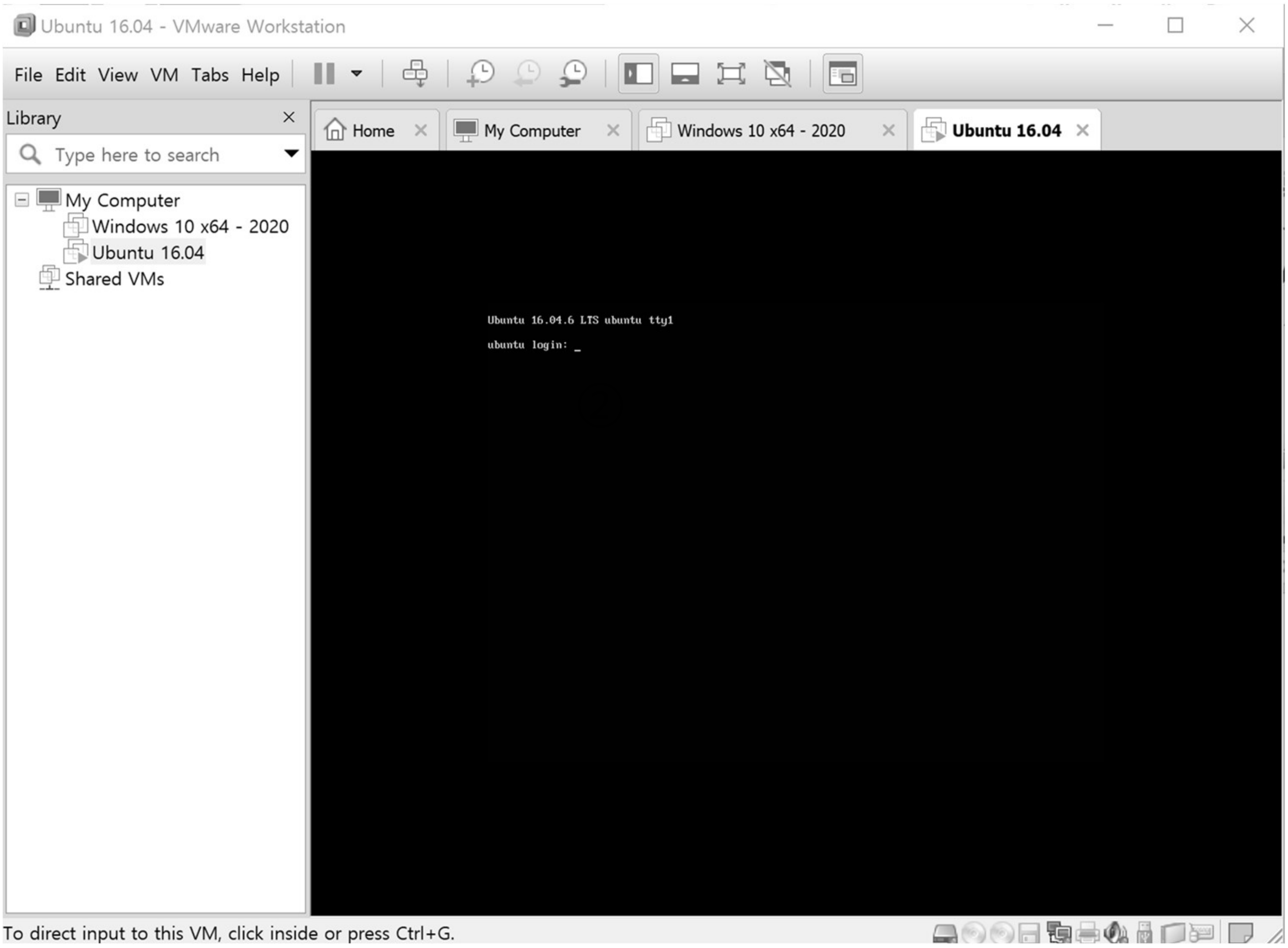
부록. VMware Lab 운영

- ❖ **KVM/QEMU** (29 of 29)
- ❖ **Ubuntu Server 16.04 Installation (예)**

① **Ubuntu Server 16.04 설치 완료 확인 (예)**

② **Ubuntu Server 16.04 계정 입력**

①



```
Ubuntu 16.04.6 LTS ubuntu tty1
ubuntu login: _
```

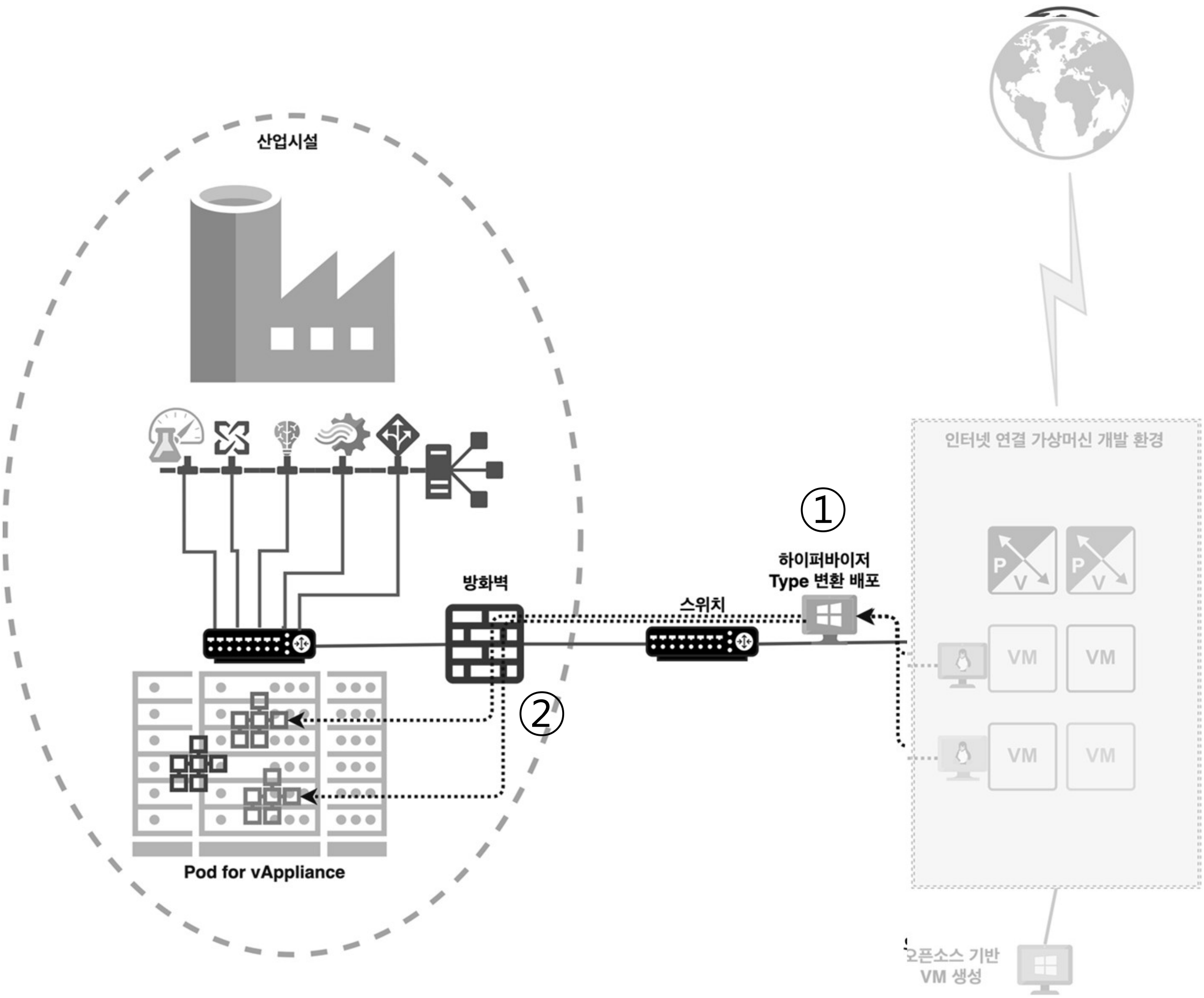
메모:

부록. VMware Lab 운영

❖ vCenter Converter Standalone (1 of 21)

① **생성한 VM을 변환**(Converter)**하여 생산시설에 배포** (VMware vCenter Converter Standalone)

② **변환 VM은 가상화 시스템에서 구동** (vSphere)

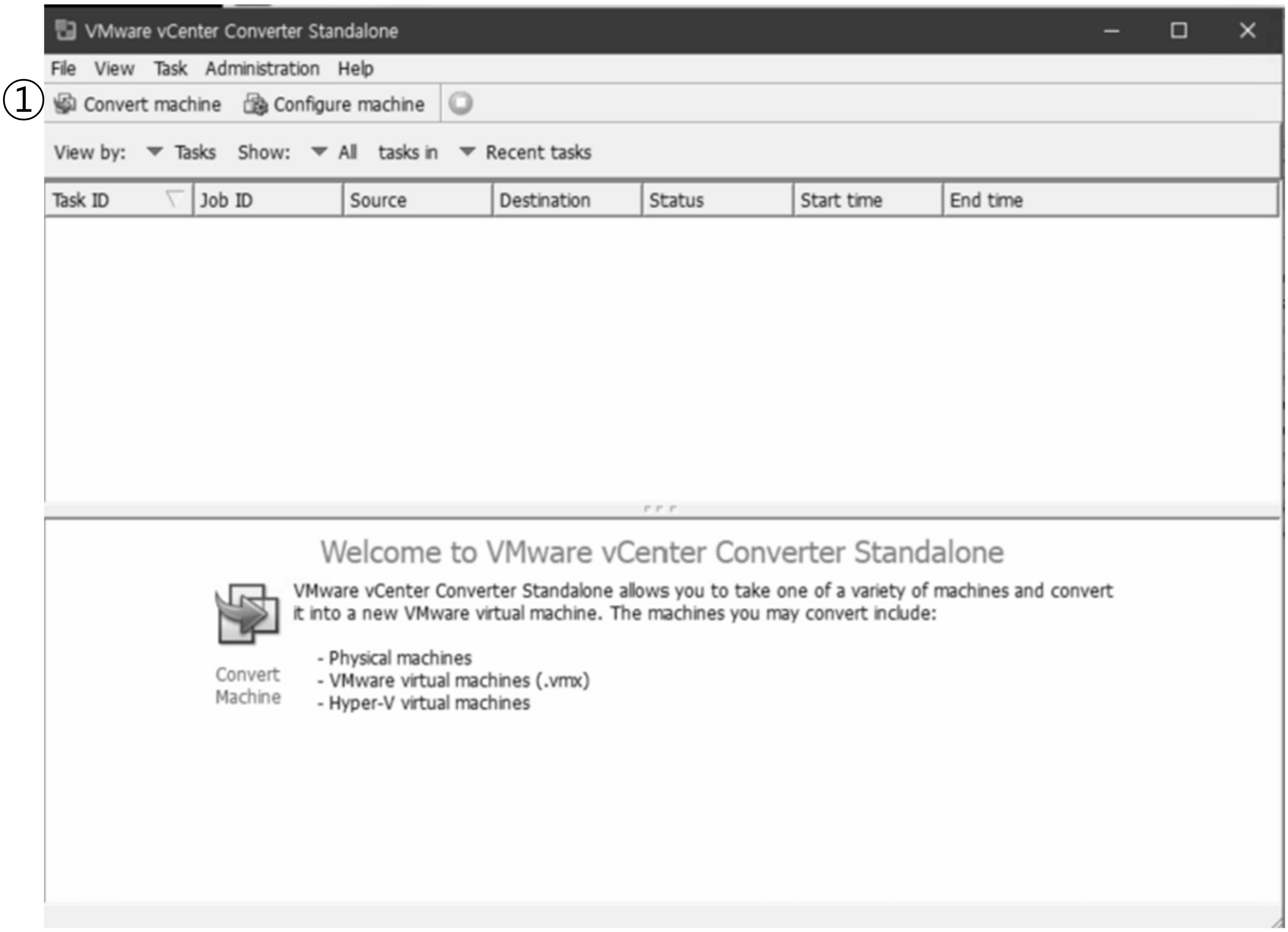


메모:

****VMware에서 ‘vCenter Converter Standalone’ 보안 업데이트를 하지않는 경우를 대비하여 물리적인 보안체계를 고려해야 함**

❖ vCenter Converter Standalone (2 of 21)

① Convert machine 선택


VMware vCenter Converter Standalone
File View Task Administration Help
①
Convert machine
Configure machine
View by: Tasks Show: All tasks in Recent tasks
Task ID
Job ID
Source
Destination
Status
Start time
End time
Convert Machine

Welcome to VMware vCenter Converter Standalone

VMware vCenter Converter Standalone allows you to take one of a variety of machines and convert it into a new VMware virtual machine. The machines you may convert include:

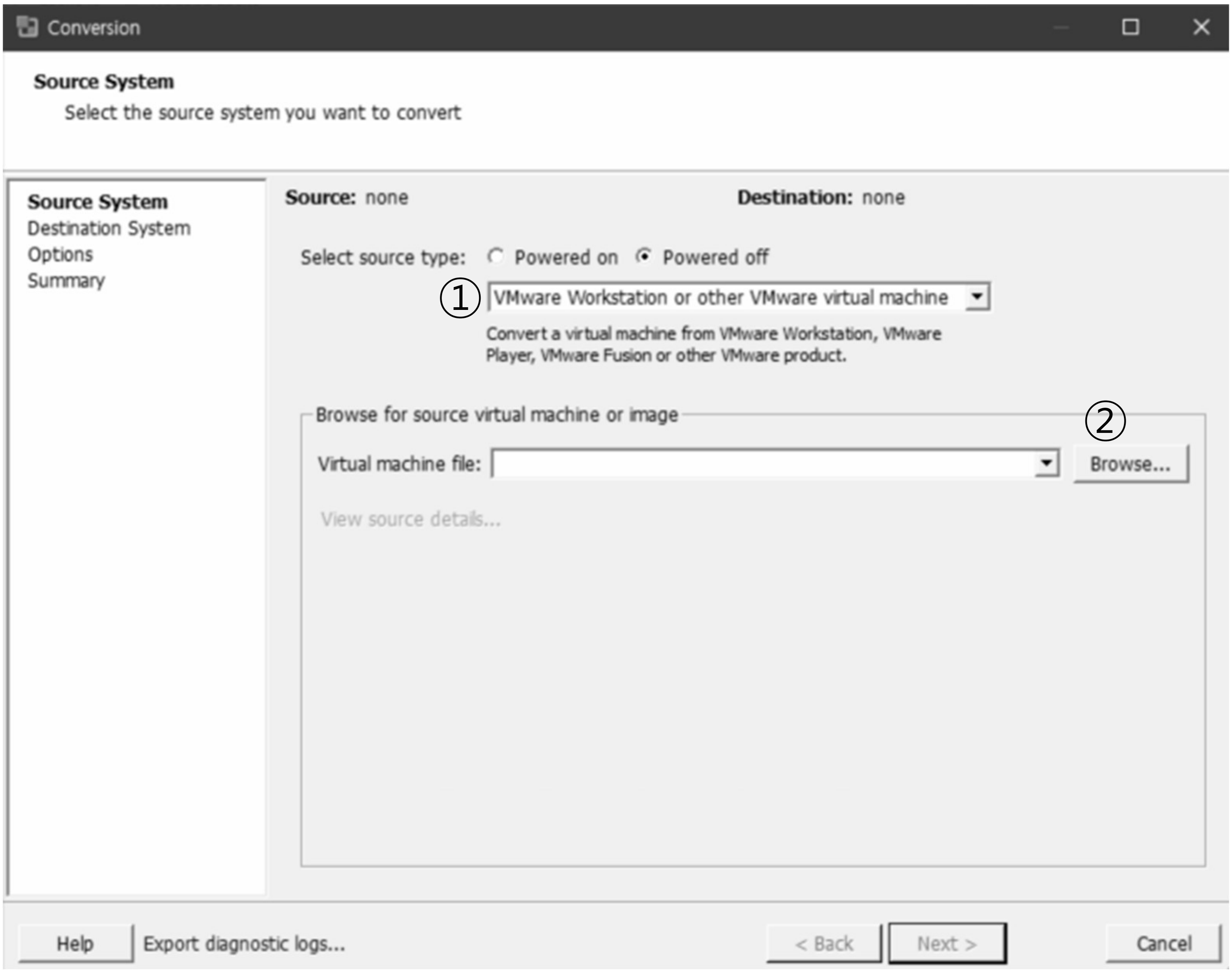
- Physical machines
- VMware virtual machines (.vmx)
- Hyper-V virtual machines

메모:

❖ vCenter Converter Standalone (3 of 21)

① Source를 Workstation 선택

② Browse 선택하여 VM 이미지 선택



Conversion

Source System

Select the source system you want to convert

Source System
Destination System
Options
Summary

Source: none **Destination:** none

Select source type: ○ Powered on ● Powered off

① VMware Workstation or other VMware virtual machine

Convert a virtual machine from VMware Workstation, VMware Player, VMware Fusion or other VMware product.

Browse for source virtual machine or image

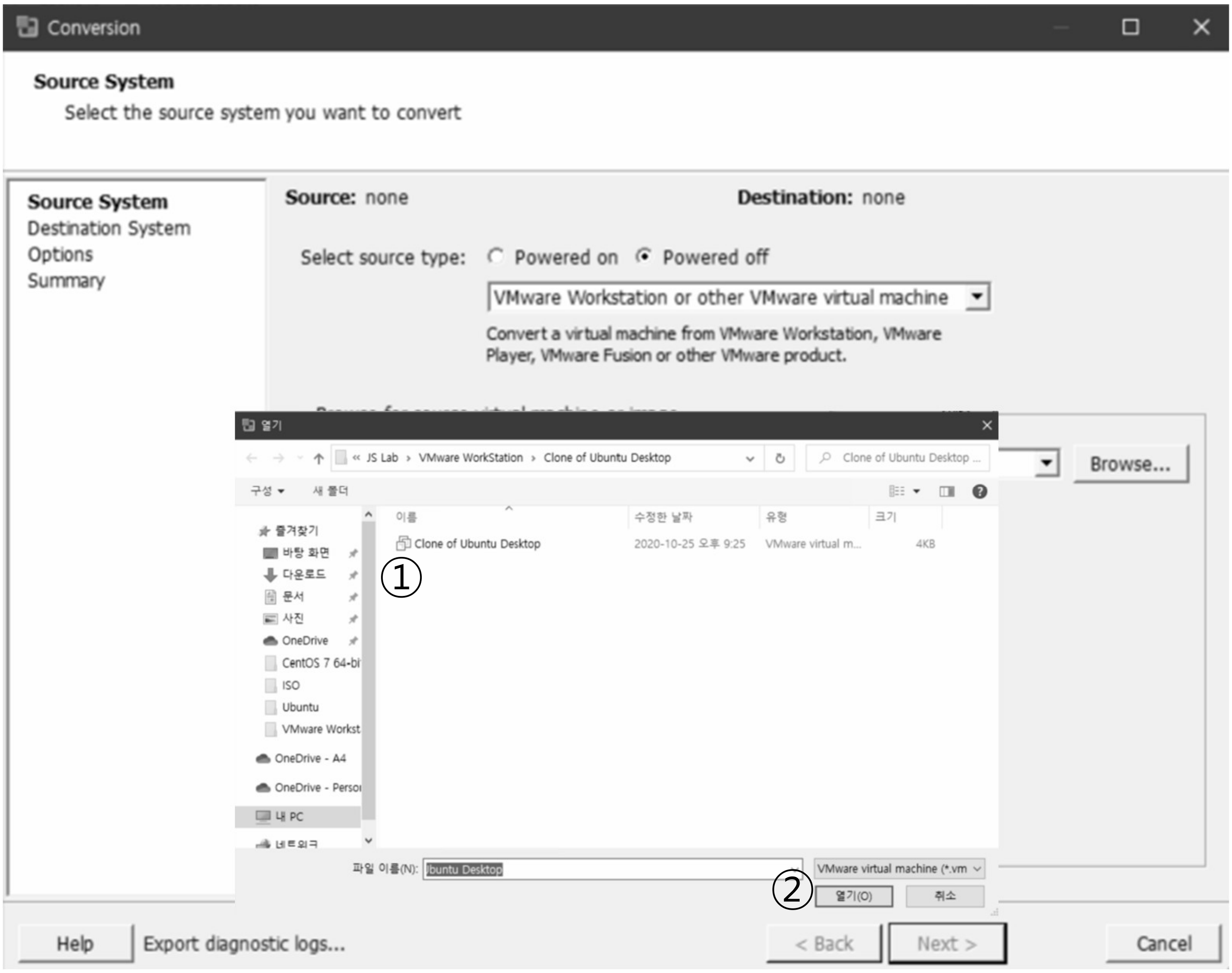
Virtual machine file: ② Browse...

View source details...

메모:

❖ vCenter Converter Standalone (4 of 21)

① **Ubuntu Desktop VM 선택**
② **열기**



Conversion

Source System
Select the source system you want to convert

Source: none **Destination:** none

Select source type: ○ Powered on ● Powered off

VMware Workstation or other VMware virtual machine

Convert a virtual machine from VMware Workstation, VMware Player, VMware Fusion or other VMware product.

열기

« JS Lab › VMware WorkStation › Clone of Ubuntu Desktop

이름	수정한 날짜	유형	크기
Clone of Ubuntu Desktop	2020-10-25 오후 9:25	VMware virtual m...	4KB

파일 이름(N): Ubuntu Desktop

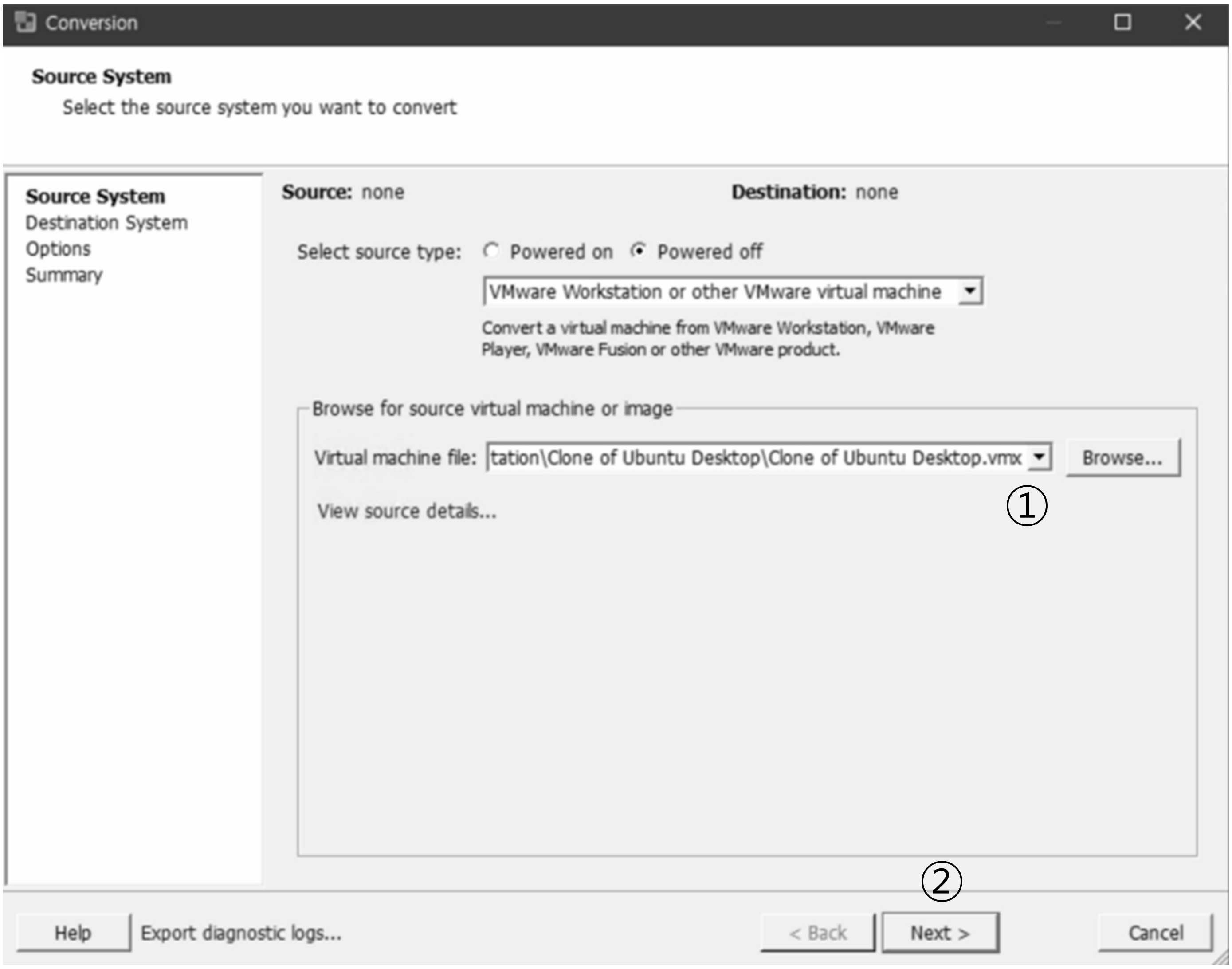
VMware virtual machine (*.vm

메모:

❖ vCenter Converter Standalone (5 of 21)

① VM file 확인 배포

② Next 선택



Conversion

Source System

Select the source system you want to convert

Source: none   Destination: none

Select source type: ○ Powered on ● Powered off

VMware Workstation or other VMware virtual machine

Convert a virtual machine from VMware Workstation, VMware Player, VMware Fusion or other VMware product.

Browse for source virtual machine or image

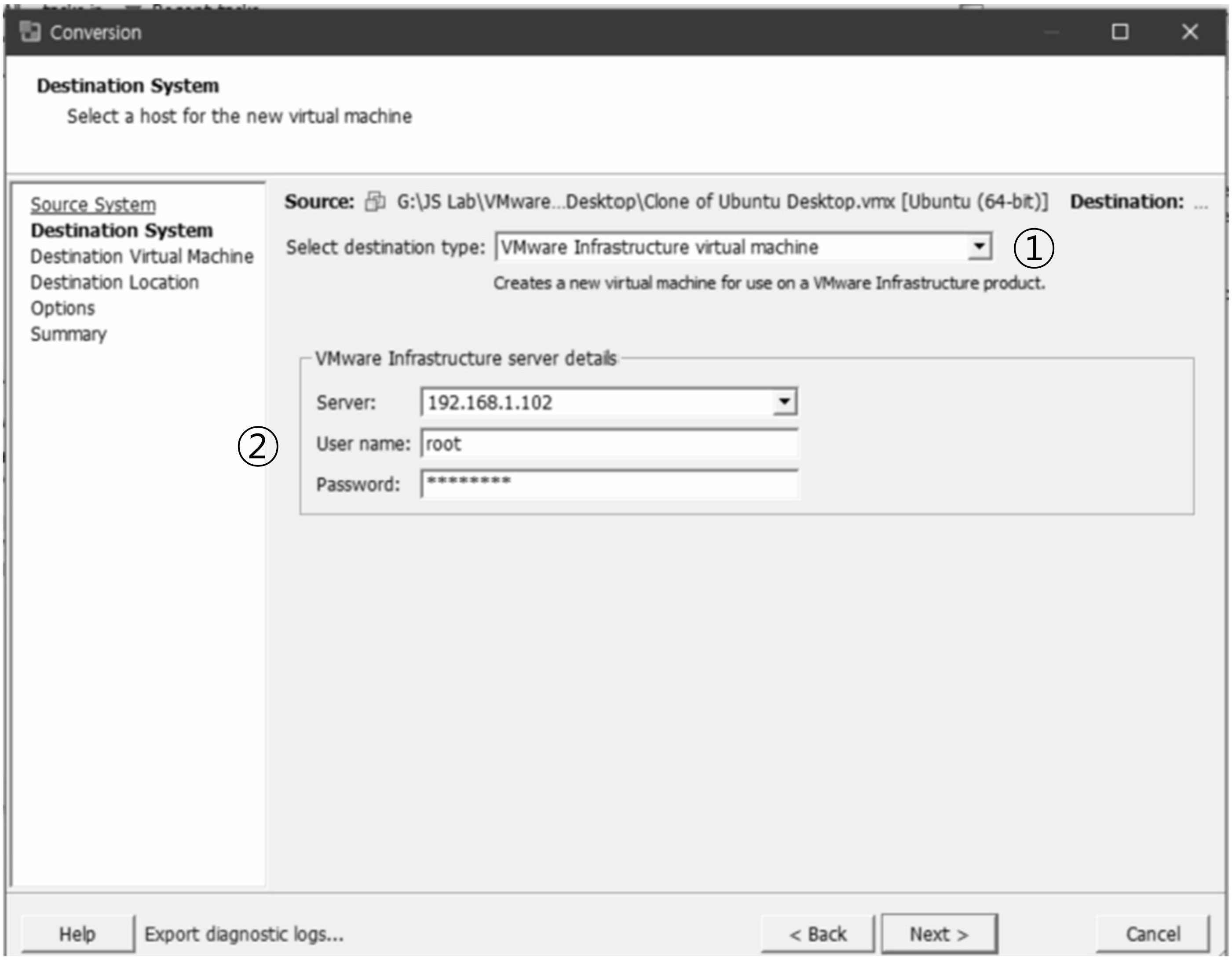
Virtual machine file: tation\Clone of Ubuntu Desktop\Clone of Ubuntu Desktop.vmx

메모:

❖ vCenter Converter Standalone (6 of 21)

① Destination은 Infrastructure를 선택

② vSphere ESXi 또는 vCenter 계정 사용



Conversion

Destination System

Select a host for the new virtual machine

Source: G:\JS Lab\VMware...Desktop\Clone of Ubuntu Desktop.vmx [Ubuntu (64-bit)] Destination: ...

Select destination type: VMware Infrastructure virtual machine ①

Creates a new virtual machine for use on a VMware Infrastructure product.

VMware Infrastructure server details

② Server: 192.168.1.102

User name: root

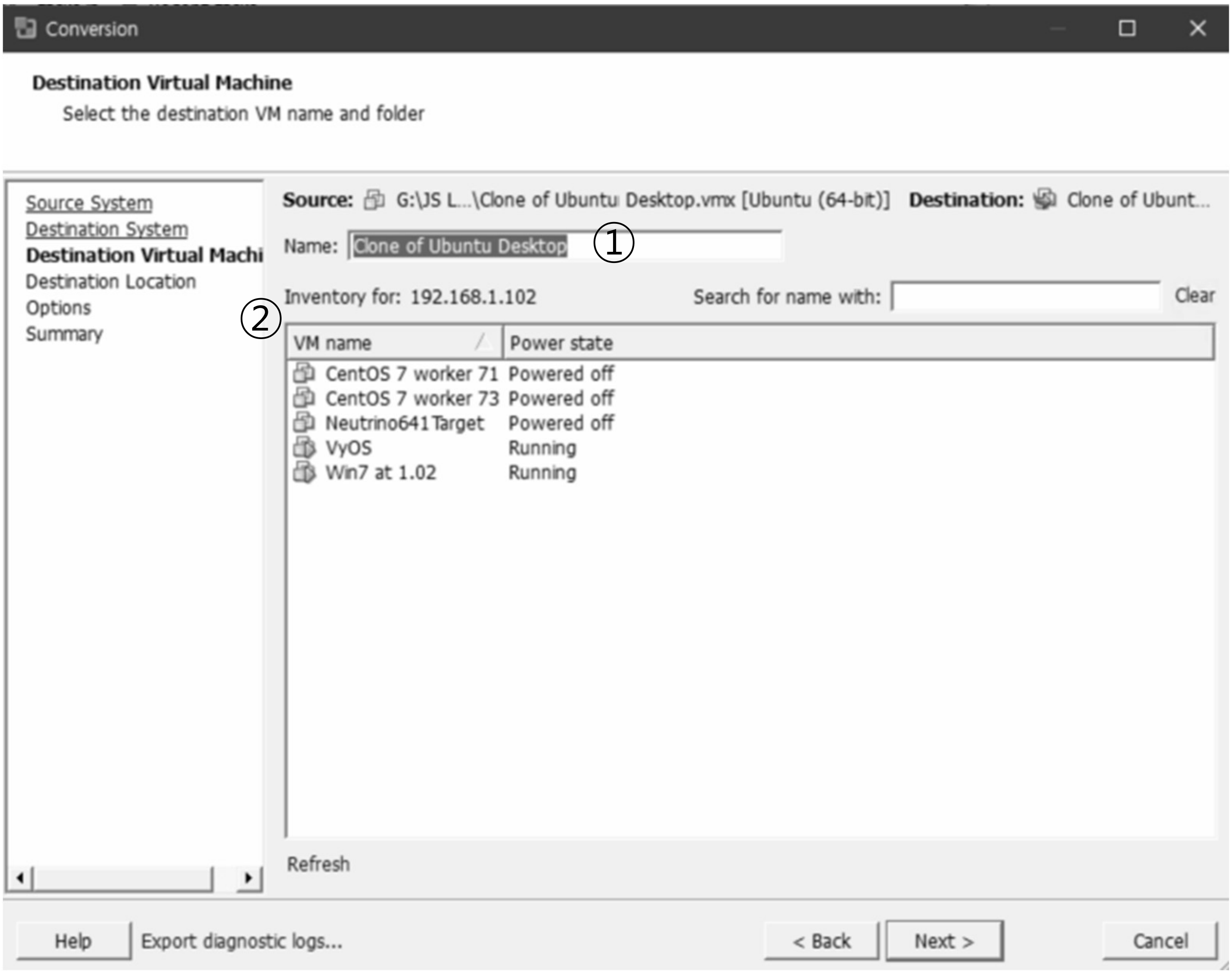
Password: ********

메모:

❖ vCenter Converter Standalone (7 of 21)

① **Name 설정**

② **Inventory 확인**



Conversion

Destination Virtual Machine

Select the destination VM name and folder

Source: G:\JS L...\Clone of Ubuntu Desktop.vmx [Ubuntu (64-bit)] **Destination:** Clone of Ubunt...

Name: Clone of Ubuntu Desktop

Inventory for: 192.168.1.102

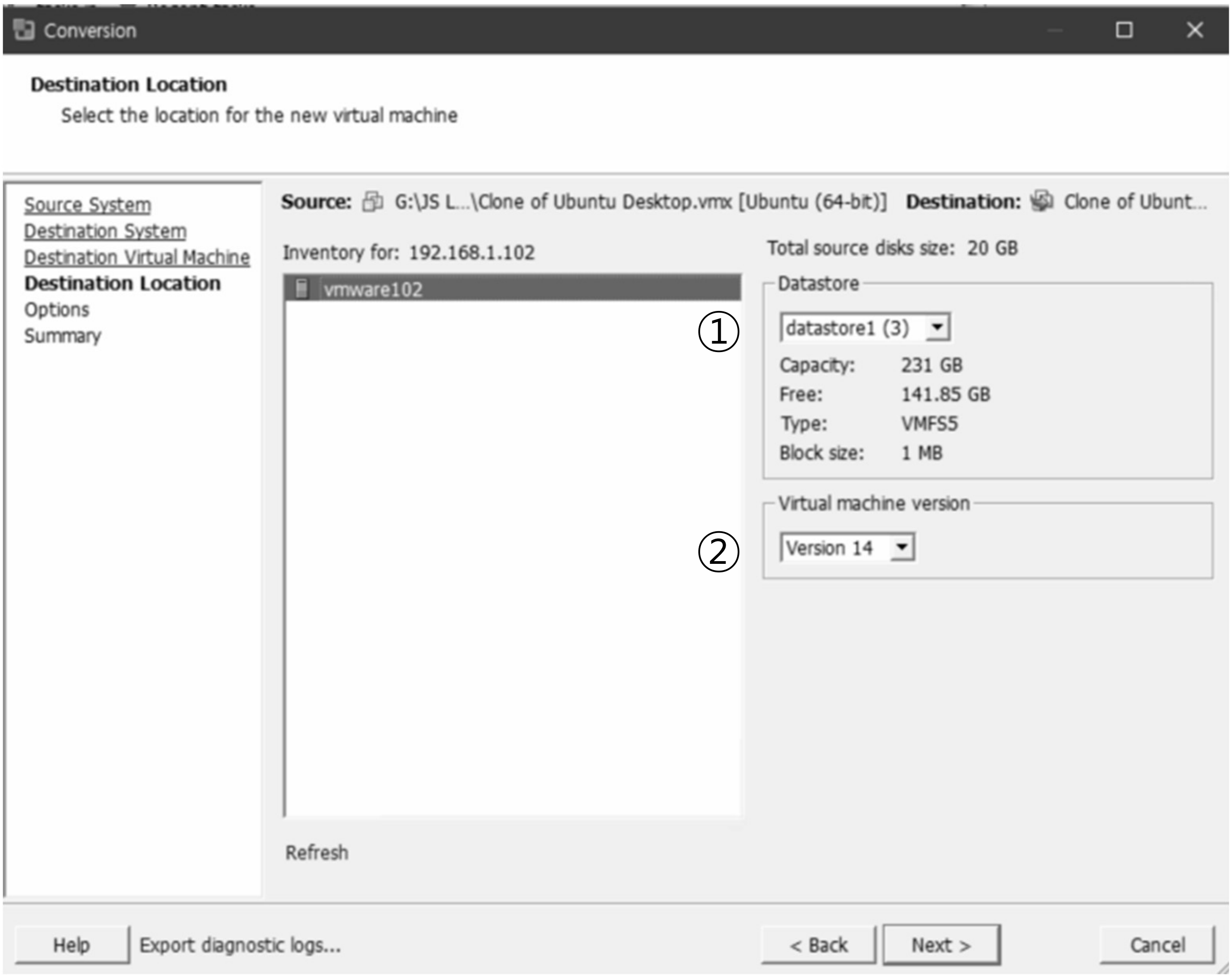
Search for name with:

VM name	Power state
CentOS 7 worker 71	Powered off
CentOS 7 worker 73	Powered off
Neutrino641Target	Powered off
VyOS	Running
Win7 at 1.02	Running

메모:

❖ vCenter Converter Standalone (8 of 21)

① **Datastore 설정**
② **Version 설정**



Conversion

Destination Location
Select the location for the new virtual machine

Source System
Destination System
Destination Virtual Machine
Destination Location
Options
Summary

Source: G:\JS L...\Clone of Ubuntu Desktop.vmx [Ubuntu (64-bit)] **Destination:** Clone of Ubunt...

Inventory for: 192.168.1.102

Total source disks size: 20 GB

Datastore
① datastore1 (3)

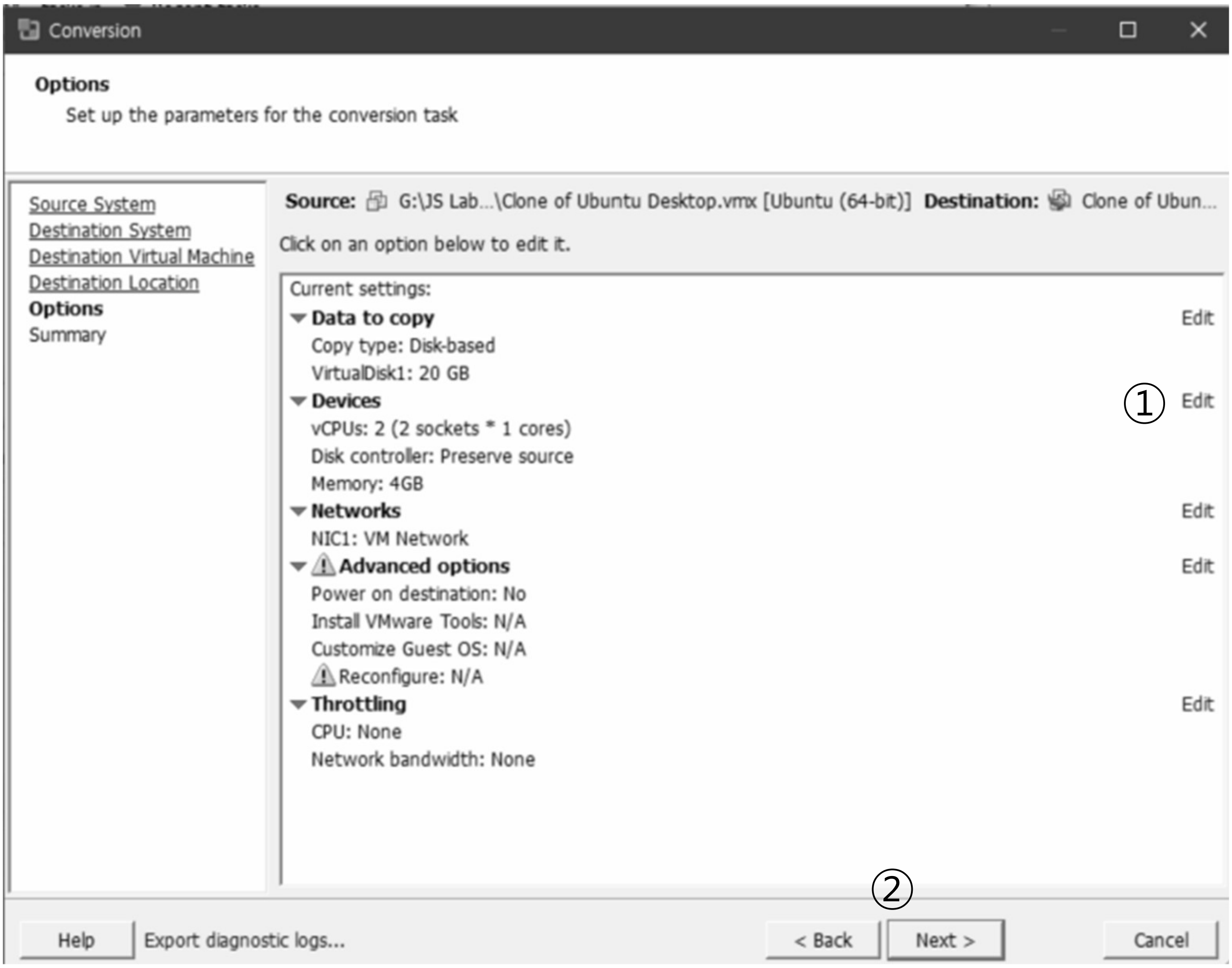
Capacity:	231 GB
Free:	141.85 GB
Type:	VMFS5
Block size:	1 MB

Virtual machine version
② Version 14

메모:

❖ vCenter Converter Standalone (9 of 21)

① **Disk 설정 확인**
② **Next**



Options

Set up the parameters for the conversion task

Source: G:\JS Lab...\Clone of Ubuntu Desktop.vmx [Ubuntu (64-bit)] Destination: Clone of Ubun...

Click on an option below to edit it.

Current settings:

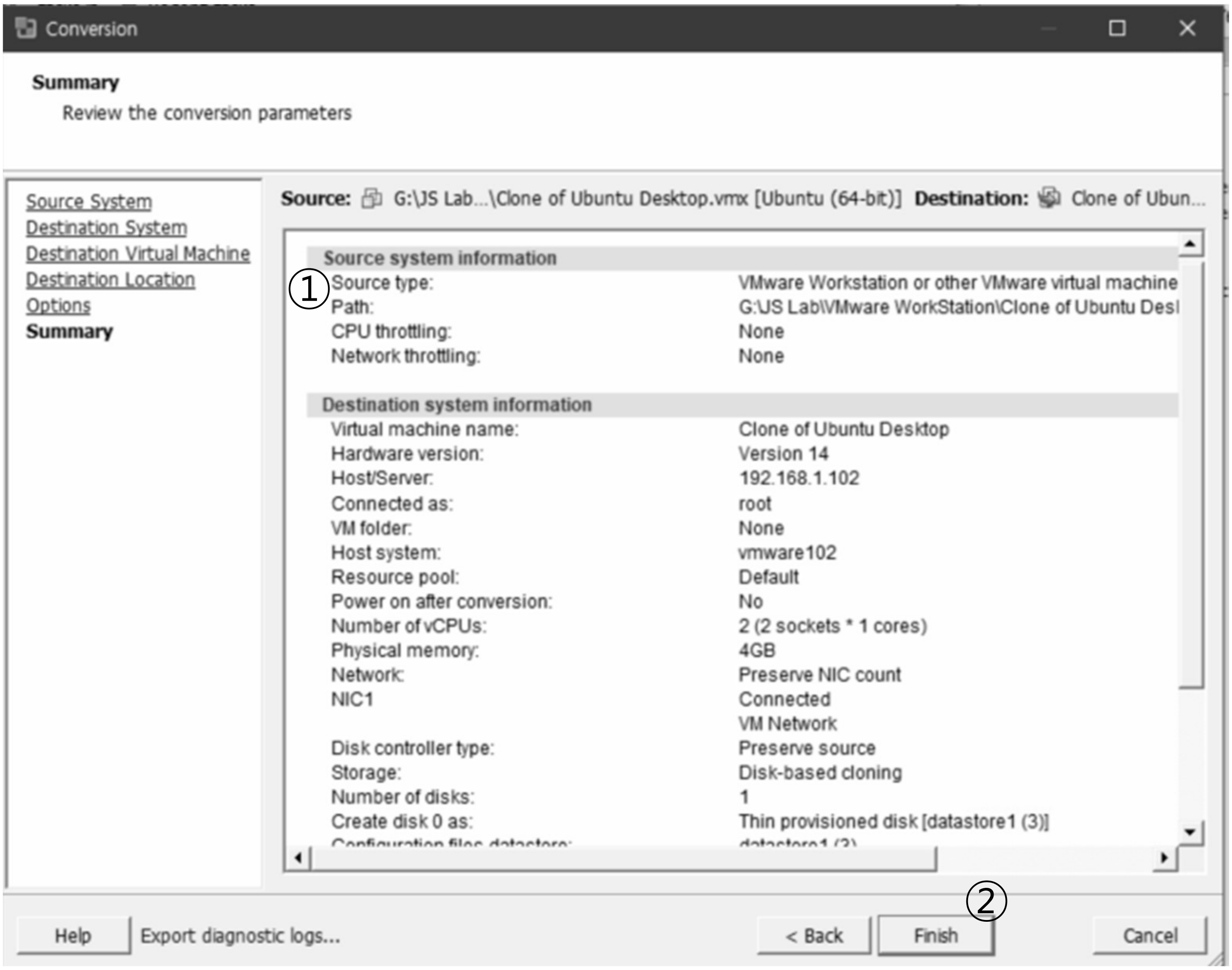
- Data to copy
  - Copy type: Disk-based
  - VirtualDisk1: 20 GB
- Devices
  - vCPUs: 2 (2 sockets * 1 cores)
  - Disk controller: Preserve source
  - Memory: 4GB
- Networks
  - NIC1: VM Network
- ⚠ Advanced options
  - Power on destination: No
  - Install VMware Tools: N/A
  - Customize Guest OS: N/A
  - ⚠ Reconfigure: N/A
- Throttling
  - CPU: None
  - Network bandwidth: None

메모:

❖ vCenter Converter Standalone (10 of 21)

① 설정 확인

② Finish



Summary

Review the conversion parameters

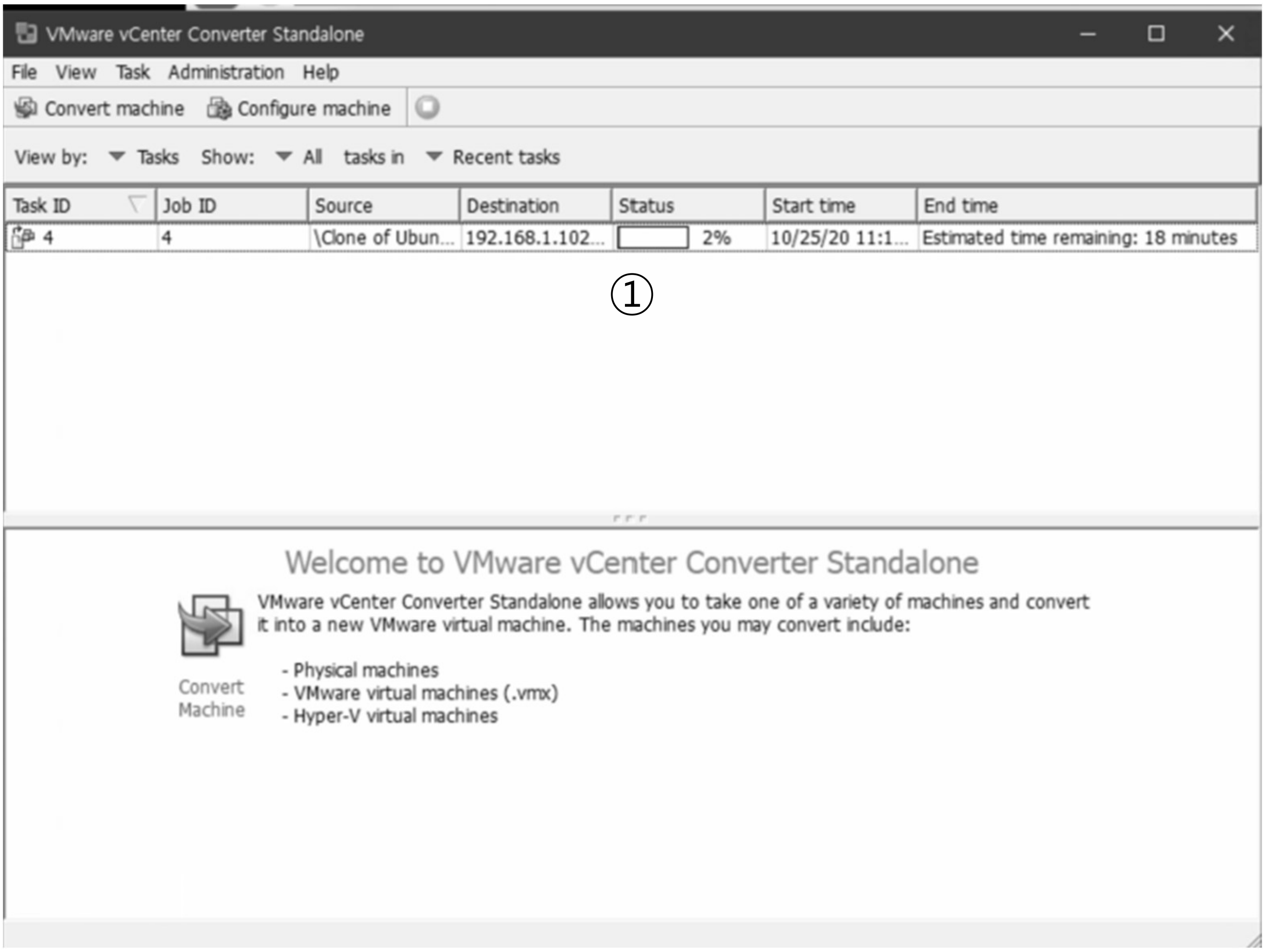
Source: G:\JS Lab...\Clone of Ubuntu Desktop.vmx [Ubuntu (64-bit)] **Destination:** Clone of Ubun...

Source system information	
Source type:	VMware Workstation or other VMware virtual machine
Path:	G:\JS Lab\VMware WorkStation\Clone of Ubuntu Desl
CPU throttling:	None
Network throttling:	None
Destination system information	
Virtual machine name:	Clone of Ubuntu Desktop
Hardware version:	Version 14
Host/Server:	192.168.1.102
Connected as:	root
VM folder:	None
Host system:	vmware102
Resource pool:	Default
Power on after conversion:	No
Number of vCPUs:	2 (2 sockets * 1 cores)
Physical memory:	4GB
Network:	Preserve NIC count
NIC1	Connected VM Network
Disk controller type:	Preserve source
Storage:	Disk-based cloning
Number of disks:	1
Create disk 0 as:	Thin provisioned disk [datastore1 (3)]
Configuration files datastore:	datastore1 (3)

메모:

❖ vCenter Converter Standalone (11 of 21)

① 진행 확인



VMware vCenter Converter Standalone
File View Task Administration Help
Convert machine
Configure machine
View by: Tasks Show: All tasks in Recent tasks
①
Welcome to VMware vCenter Converter Standalone
Convert Machine

Task ID	Job ID	Source	Destination	Status	Start time	End time
4	4	\Clone of Ubun...	192.168.1.102...	2%	10/25/20 11:1...	Estimated time remaining: 18 minutes

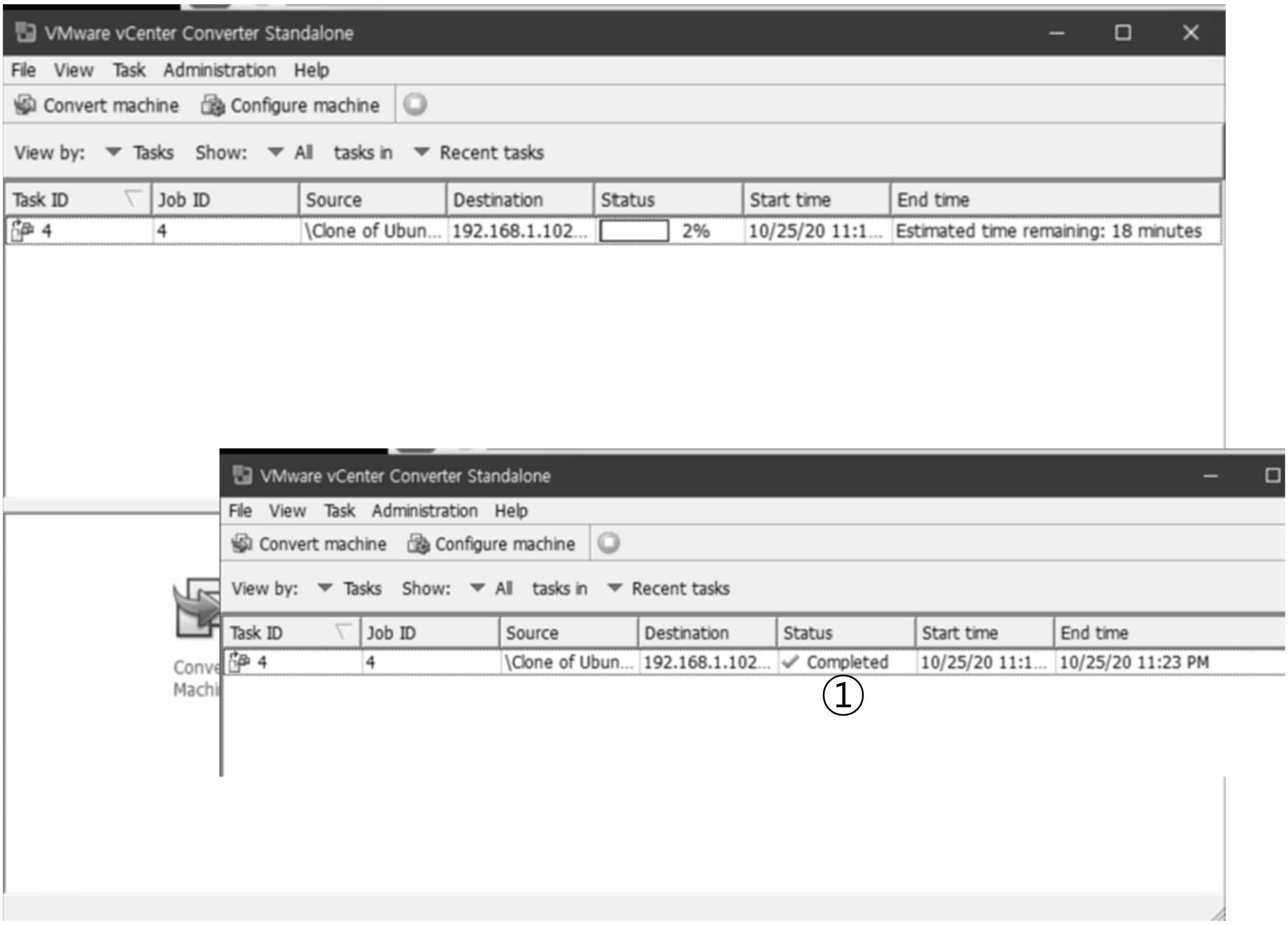
VMware vCenter Converter Standalone allows you to take one of a variety of machines and convert it into a new VMware virtual machine. The machines you may convert include:

- Physical machines
- VMware virtual machines (.vmx)
- Hyper-V virtual machines

메모:

❖ vCenter Converter Standalone (12 of 21)

① 진행 완료 확인


VMware vCenter Converter Standalone
File View Task Administration Help
Convert machine
Configure machine
View by: Tasks Show: All tasks in Recent tasks
Conve
Machi
①

Task ID	Job ID	Source	Destination	Status	Start time	End time
4	4	\Clone of Ubun...	192.168.1.102...	2%	10/25/20 11:1...	Estimated time remaining: 18 minutes

Task ID	Job ID	Source	Destination	Status	Start time	End time
4	4	\Clone of Ubun...	192.168.1.102...	✓ Completed	10/25/20 11:1...	10/25/20 11:23 PM

메모:

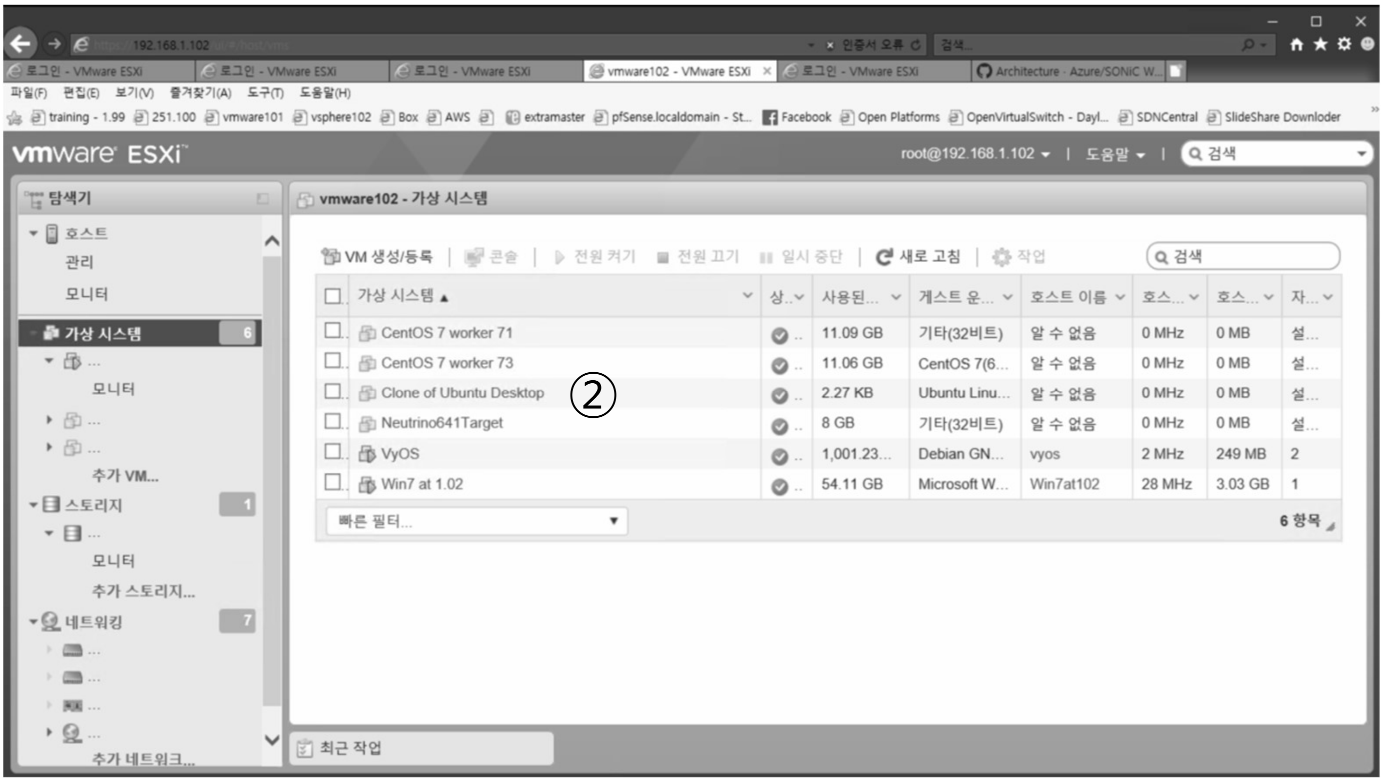
부록. VMware Lab 운영

❖ vCenter Converter Standalone (13 of 21)

① **ESXi 접속**

② **Ubuntu Desktop VM 확인**

①



vmware102 - 가상 시스템

가상 시스템 ▲	상...	사용된...	게스트 운...	호스트 이름	호스...	호스...	자...
CentOS 7 worker 71	✓ ..	11.09 GB	기타(32비트)	알 수 없음	0 MHz	0 MB	설...
CentOS 7 worker 73	✓ ..	11.06 GB	CentOS 7(6...	알 수 없음	0 MHz	0 MB	설...
Clone of Ubuntu Desktop	✓ ..	2.27 KB	Ubuntu Linu...	알 수 없음	0 MHz	0 MB	설...
Neutrino641Target	✓ ..	8 GB	기타(32비트)	알 수 없음	0 MHz	0 MB	설...
VyOS	✓ ..	1,001.23...	Debian GN...	vyos	2 MHz	249 MB	2
Win7 at 1.02	✓ ..	54.11 GB	Microsoft W...	Win7at102	28 MHz	3.03 GB	1

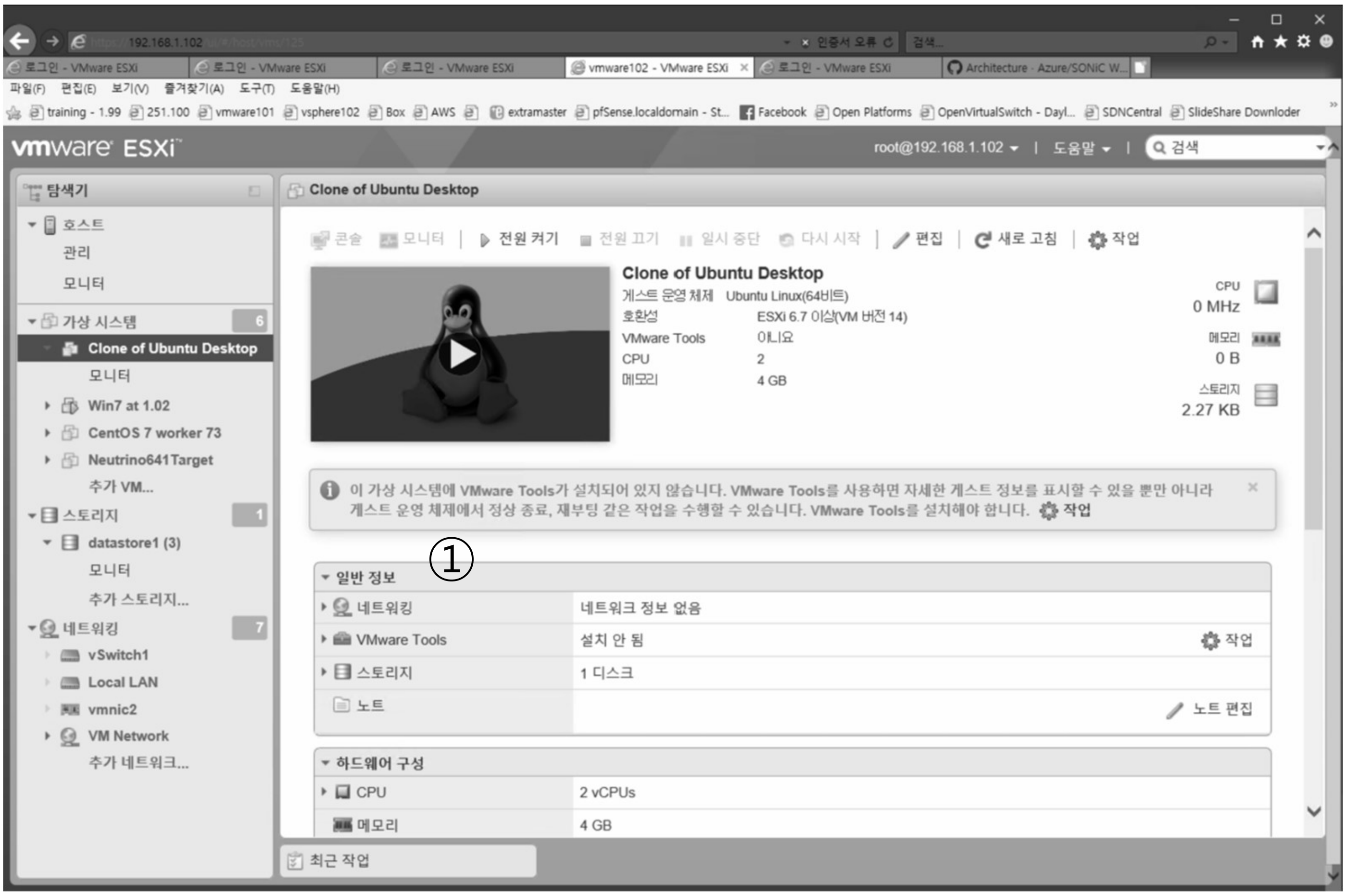
빠른 필터... ▾

6 항목

메모:

❖ **vCenter Converter Standalone** (14 of 21)

① 설정 확인



Clone of Ubuntu Desktop

게스트 운영 체제	Ubuntu Linux(64비트)
호환성	ESXi 6.7 이상(VM 버전 14)
VMware Tools	아니요
CPU	2
메모리	4 GB

CPU 0 MHz
메모리 0 B
스토리지 2.27 KB

이 가상 시스템에 VMware Tools가 설치되어 있지 않습니다. VMware Tools를 사용하면 자세한 게스트 정보를 표시할 수 있을 뿐만 아니라 게스트 운영 체제에서 정상 종료, 재부팅 같은 작업을 수행할 수 있습니다. VMware Tools를 설치해야 합니다. 작업

일반 정보		
네트워킹	네트워크 정보 없음	
VMware Tools	설치 안 됨	작업
스토리지	1 디스크	
노트		노트 편집

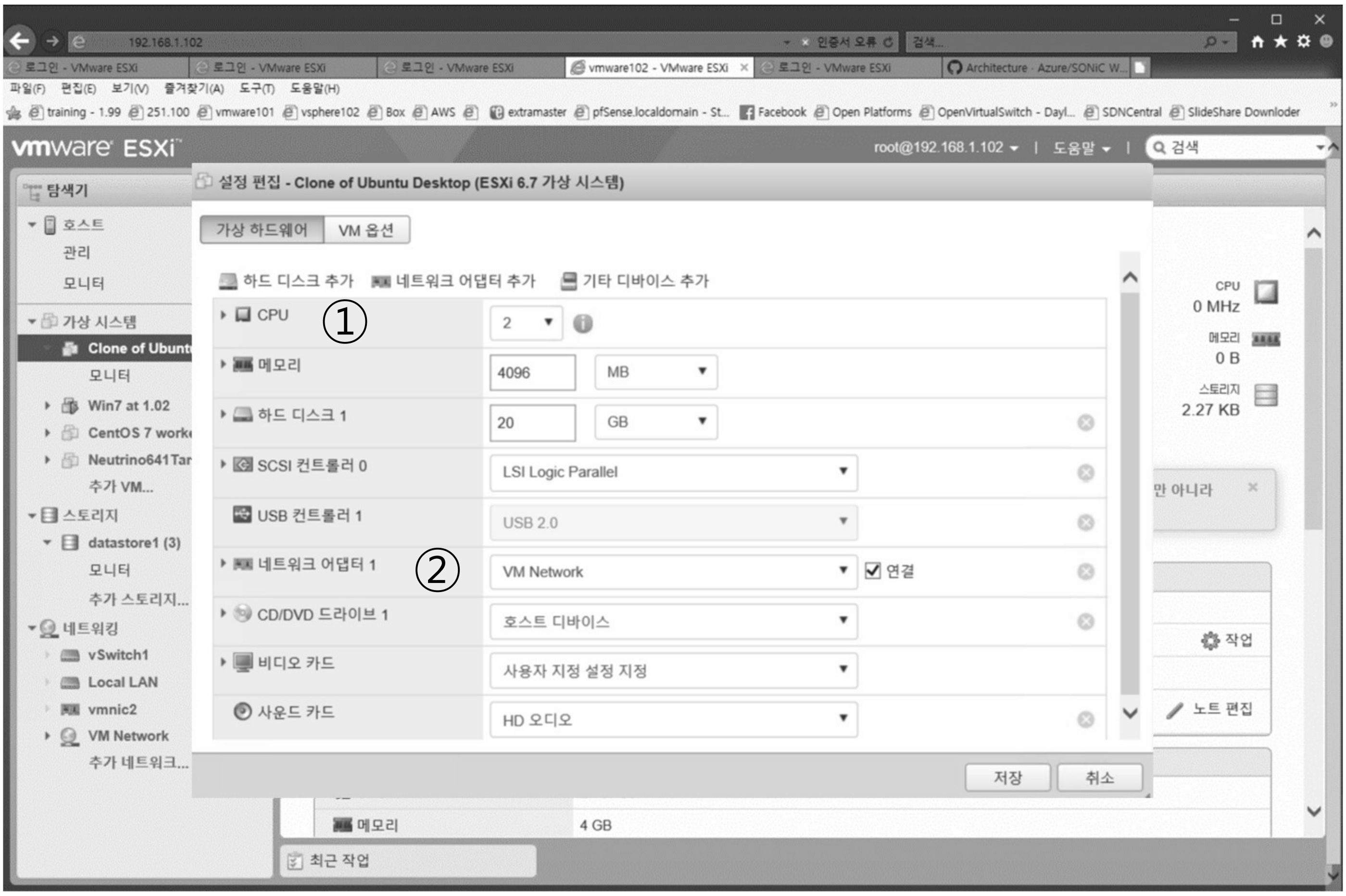
하드웨어 구성	
CPU	2 vCPUs
메모리	4 GB

메모:

❖ vCenter Converter Standalone (15 of 21)

① CPU 설정 확인

② Network 설정 확인



설정 편집 - Clone of Ubuntu Desktop (ESXi 6.7 가상 시스템)

가상 하드웨어 | VM 옵션

하드 디스크 추가 | 네트워크 어댑터 추가 | 기타 디바이스 추가

CPU ①	2
메모리	4096 MB
하드 디스크 1	20 GB
SCSI 컨트롤러 0	LSI Logic Parallel
USB 컨트롤러 1	USB 2.0
네트워크 어댑터 1 ②	VM Network ☑ 연결
CD/DVD 드라이브 1	호스트 디바이스
비디오 카드	사용자 지정 설정 지정
사운드 카드	HD 오디오

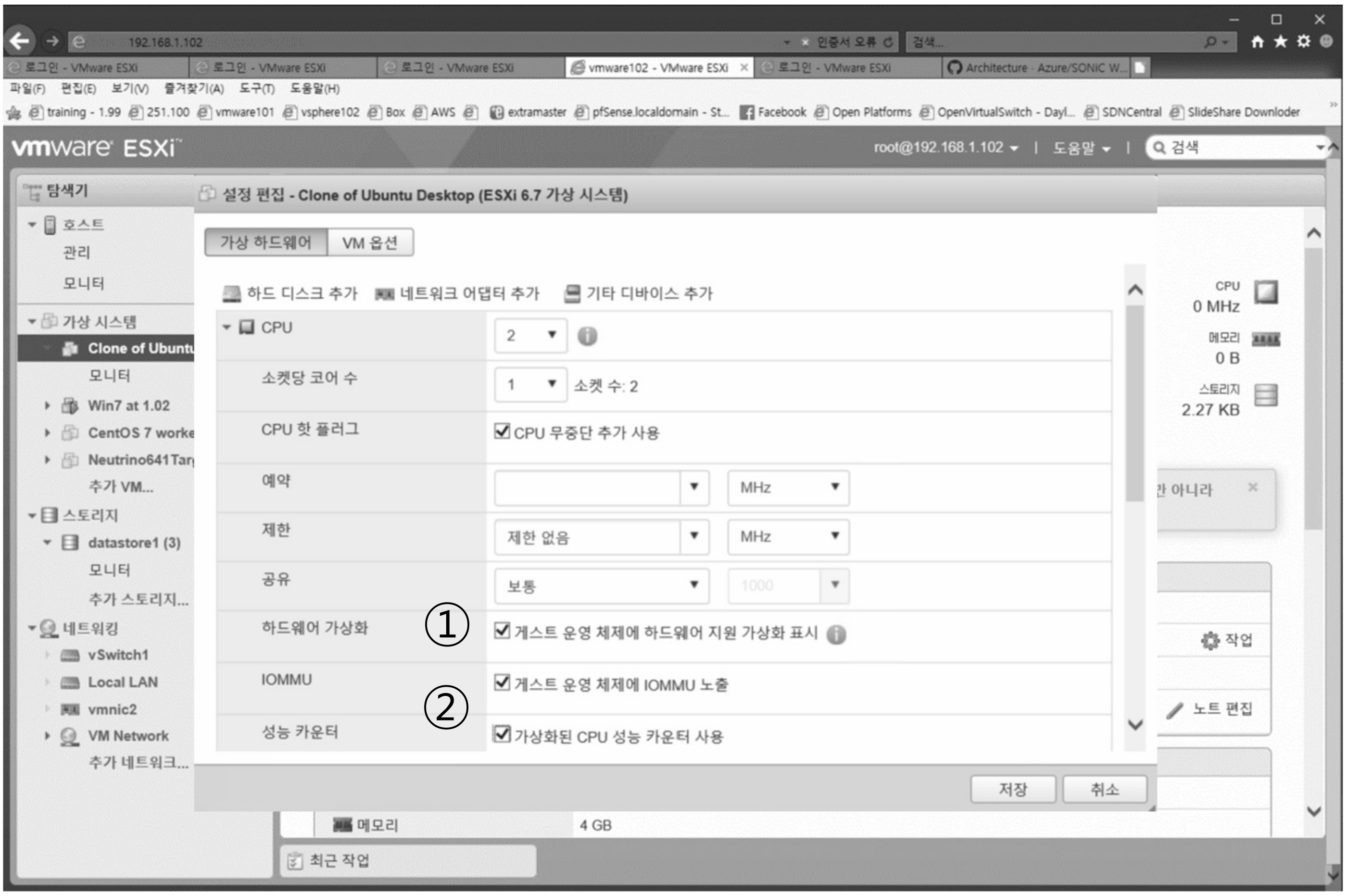
저장 | 취소

메모:

부록. VMware Lab 운영

❖ **vCenter Converter Standalone** (16 of 21)

① **가상화 표시 설정 확인 (필수)**
② **IOMMU/성능카운터 설정 확인 (선택)**



설정 편집 - Clone of Ubuntu Desktop (ESXi 6.7 가상 시스템)

가상 하드웨어 | VM 옵션

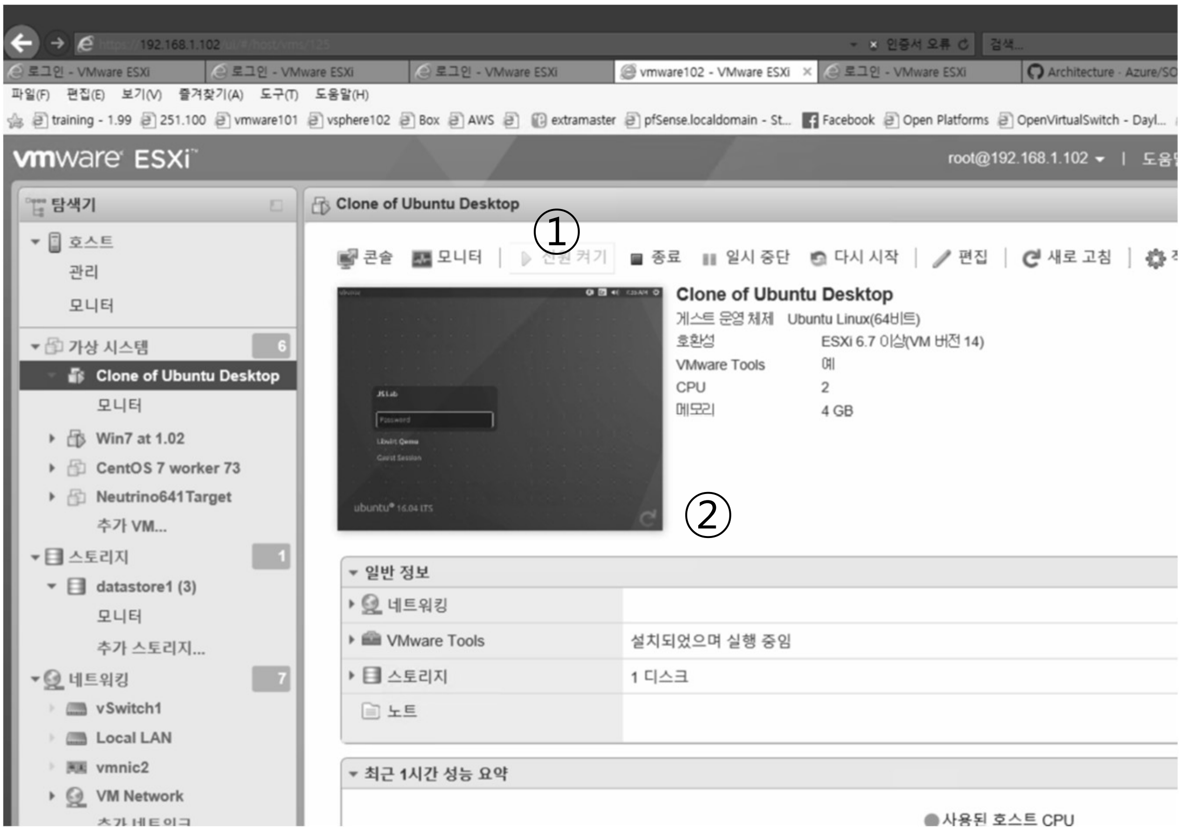
CPU	2
소켓당 코어 수	1 소켓 수: 2
CPU 핫 플러그	☑ CPU 무중단 추가 사용
예약	MHz
제한	제한 없음 MHz
공유	보통 1000
하드웨어 가상화 ①	☑ 게스트 운영 체제에 하드웨어 지원 가상화 표시
IOMMU ②	☑ 게스트 운영 체제에 IOMMU 노출
성능 카운터	☑ 가상화된 CPU 성능 카운터 사용

메모:

부록. VMware Lab 운영

❖ vCenter Converter Standalone (17 of 21)

① **전원 Start**
② **콘솔 화면 확인**



Clone of Ubuntu Desktop

Clone of Ubuntu Desktop

게스트 운영 체제	Ubuntu Linux(64비트)
호환성	ESXi 6.7 이상(VM 버전 14)
VMware Tools	예
CPU	2
메모리	4 GB

일반 정보

네트워킹	
VMware Tools	설치되었으며 실행 중임
스토리지	1 디스크
노트	

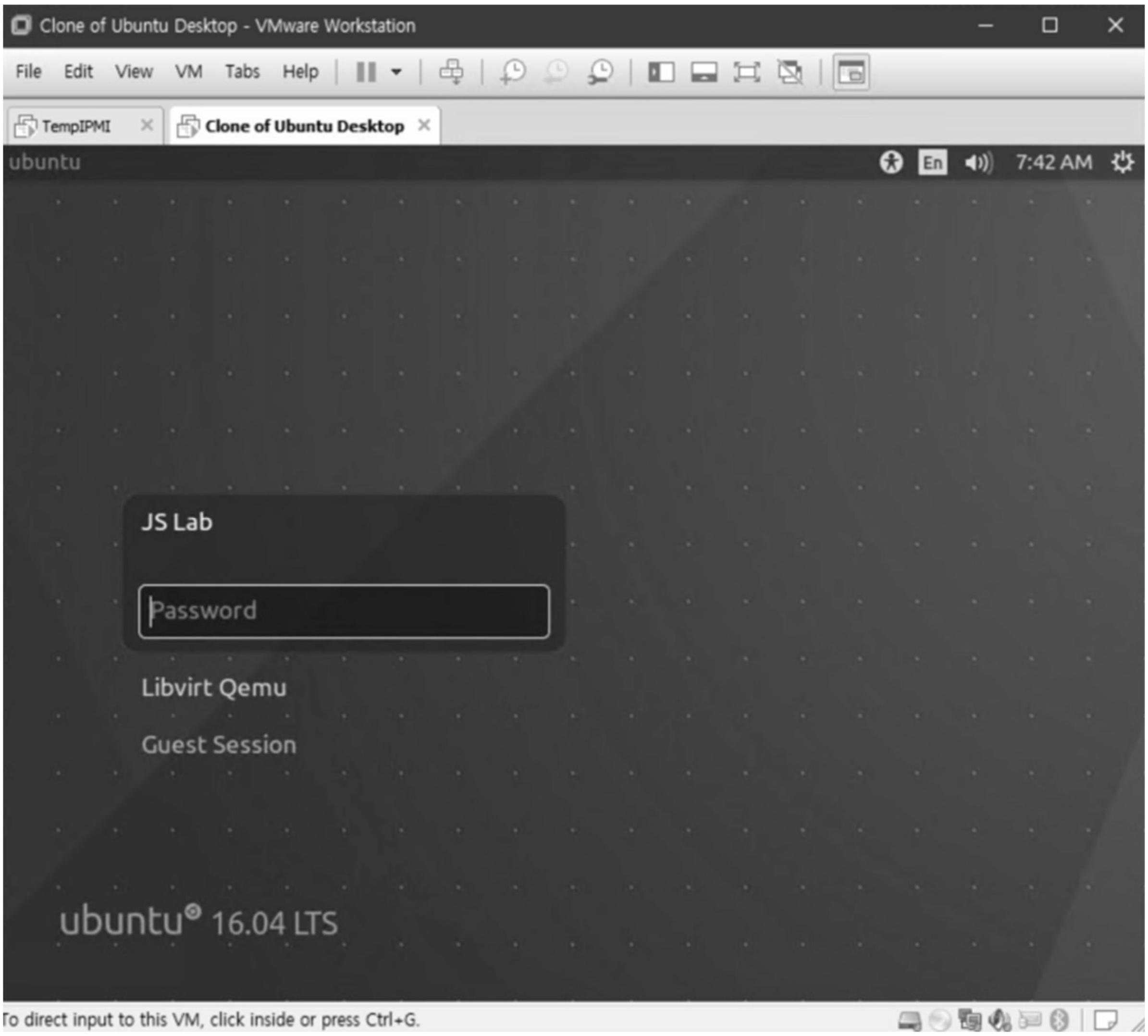
메모:

❖ vCenter Converter Standalone (18 of 21)

① **Remote console**
② **암호 사용**

①

②

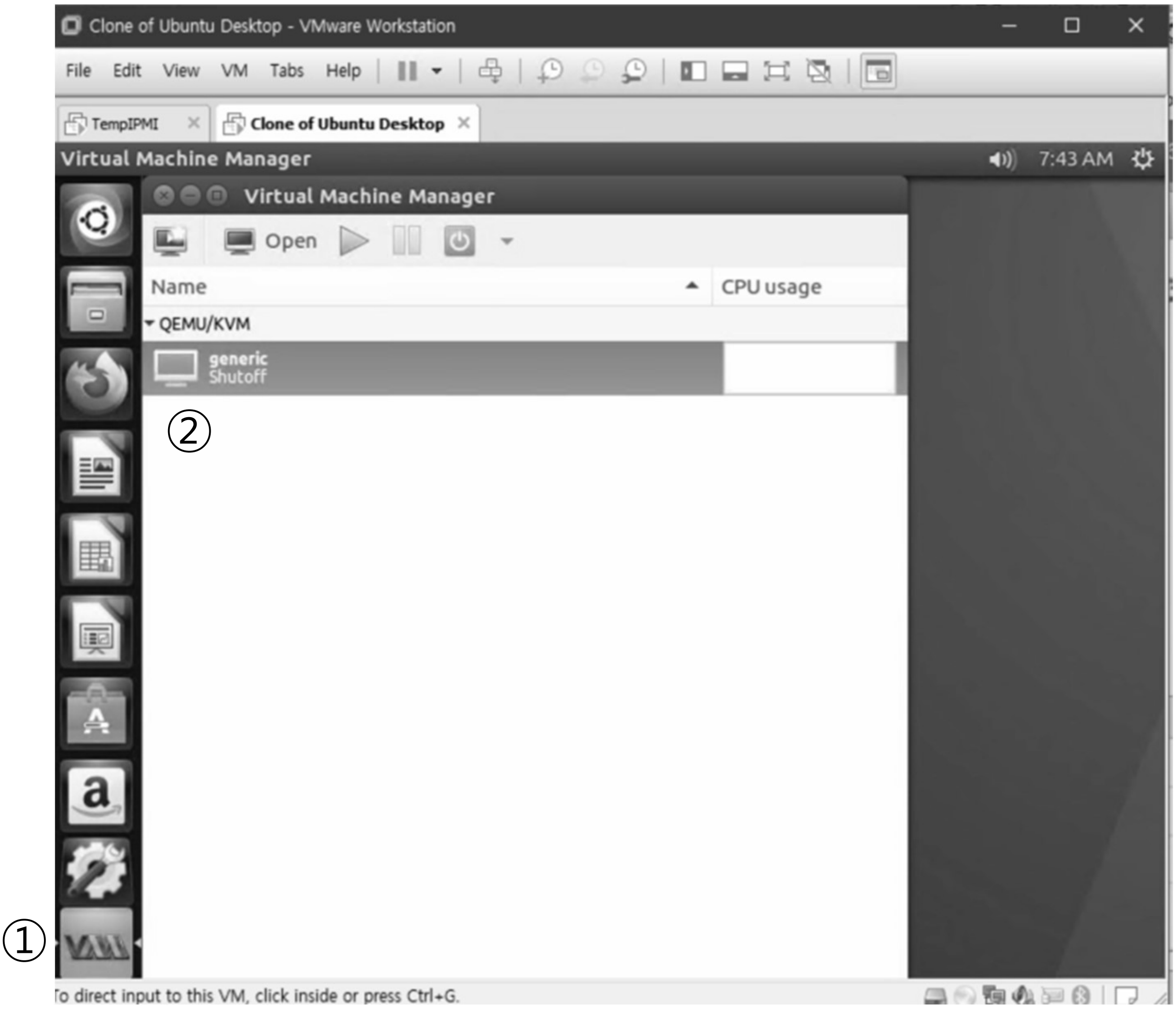


Clone of Ubuntu Desktop - VMware Workstation
File Edit View VM Tabs Help
TempIPMI
Clone of Ubuntu Desktop
ubuntu
En
7:42 AM
JS Lab
Password
Libvirt Qemu
Guest Session
ubuntu® 16.04 LTS
To direct input to this VM, click inside or press Ctrl+G.

메모:

❖ vCenter Converter Standalone (19 of 21)

① **Virtual Machine Manager 시작**
② **Nested VM 'Ubuntu Server 16.04' 확인**

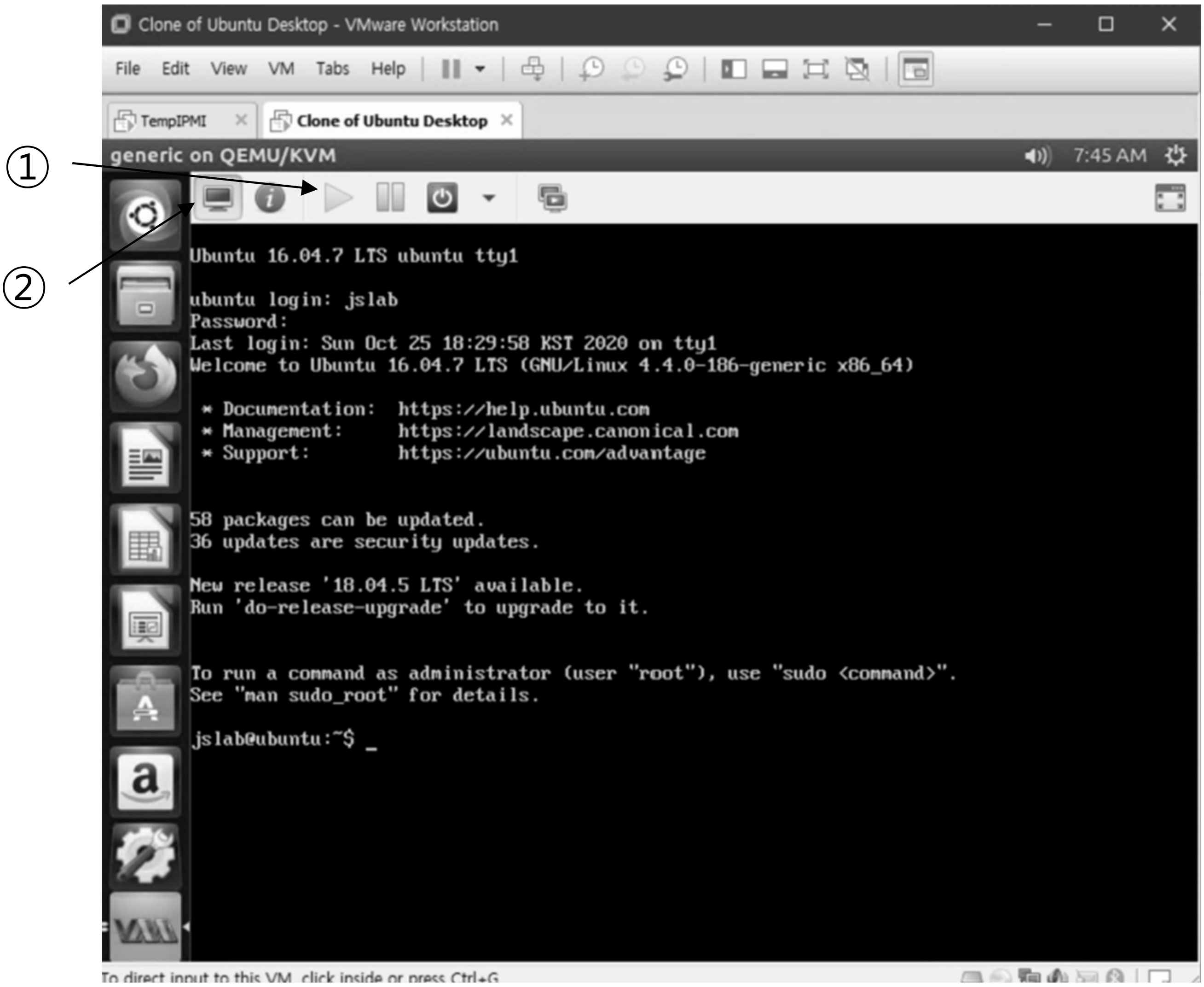


메모:

❖ vCenter Converter Standalone (20 of 21)

① Nested VM 'Ubuntu Server 16.04' 시작

② 콘솔창 열기


Clone of Ubuntu Desktop - VMware Workstation
File Edit View VM Tabs Help
TempIPMI
Clone of Ubuntu Desktop
generic on QEMU/KVM
7:45 AM
①
②
To direct input to this VM, click inside or press Ctrl+G

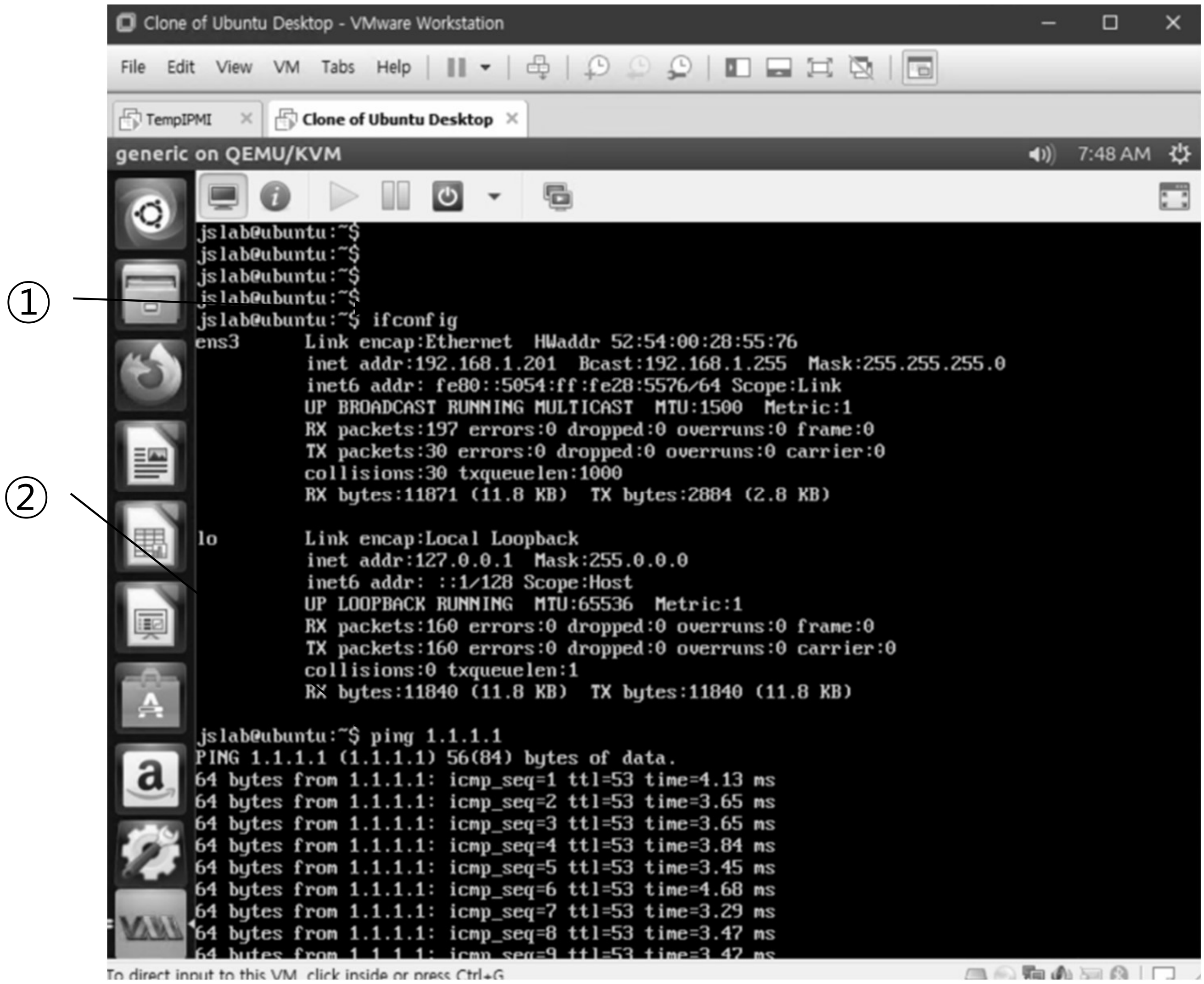
```
Ubuntu 16.04.7 LTS ubuntu tty1

ubuntu login: jslab
Password:
Last login: Sun Oct 25 18:29:58 KST 2020 on tty1
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.4.0-186-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage


58 packages can be updated.
36 updates are security updates.

New release '18.04.5 LTS' available.
Run 'do-release-upgrade' to upgrade to it.


To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

jslab@ubuntu:~$ _
```

메모:

❖ vCenter Converter Standalone (21 of 21)

① **Nested VM의 네트워크 설정 확인 ifconfig**

② **외부 연결 확인 ping 1.1.1.1**


①
②
Clone of Ubuntu Desktop - VMware Workstation
File Edit View VM Tabs Help
TempIPMI
Clone of Ubuntu Desktop
generic on QEMU/KVM
7:48 AM
To direct input to this VM, click inside or press Ctrl+G.

```
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$
jslab@ubuntu:~$ ifconfig
ens3      Link encap:Ethernet  HWaddr 52:54:00:28:55:76
          inet addr:192.168.1.201  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::5054:ff:fe28:5576/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:197 errors:0 dropped:0 overruns:0 frame:0
          TX packets:30 errors:0 dropped:0 overruns:0 carrier:0
          collisions:30 txqueuelen:1000
          RX bytes:11871 (11.8 KB)  TX bytes:2884 (2.8 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:160 errors:0 dropped:0 overruns:0 frame:0
          TX packets:160 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:11840 (11.8 KB)  TX bytes:11840 (11.8 KB)

jslab@ubuntu:~$ ping 1.1.1.1
PING 1.1.1.1 (1.1.1.1) 56(84) bytes of data.
64 bytes from 1.1.1.1: icmp_seq=1 ttl=53 time=4.13 ms
64 bytes from 1.1.1.1: icmp_seq=2 ttl=53 time=3.65 ms
64 bytes from 1.1.1.1: icmp_seq=3 ttl=53 time=3.65 ms
64 bytes from 1.1.1.1: icmp_seq=4 ttl=53 time=3.84 ms
64 bytes from 1.1.1.1: icmp_seq=5 ttl=53 time=3.45 ms
64 bytes from 1.1.1.1: icmp_seq=6 ttl=53 time=4.68 ms
64 bytes from 1.1.1.1: icmp_seq=7 ttl=53 time=3.29 ms
64 bytes from 1.1.1.1: icmp_seq=8 ttl=53 time=3.47 ms
64 bytes from 1.1.1.1: icmp_seq=9 ttl=53 time=3.42 ms
```

메모:

감사합니다.