DATABASE SYSTEM PRINCIPLE - ENVIRONMENT FOR LAB

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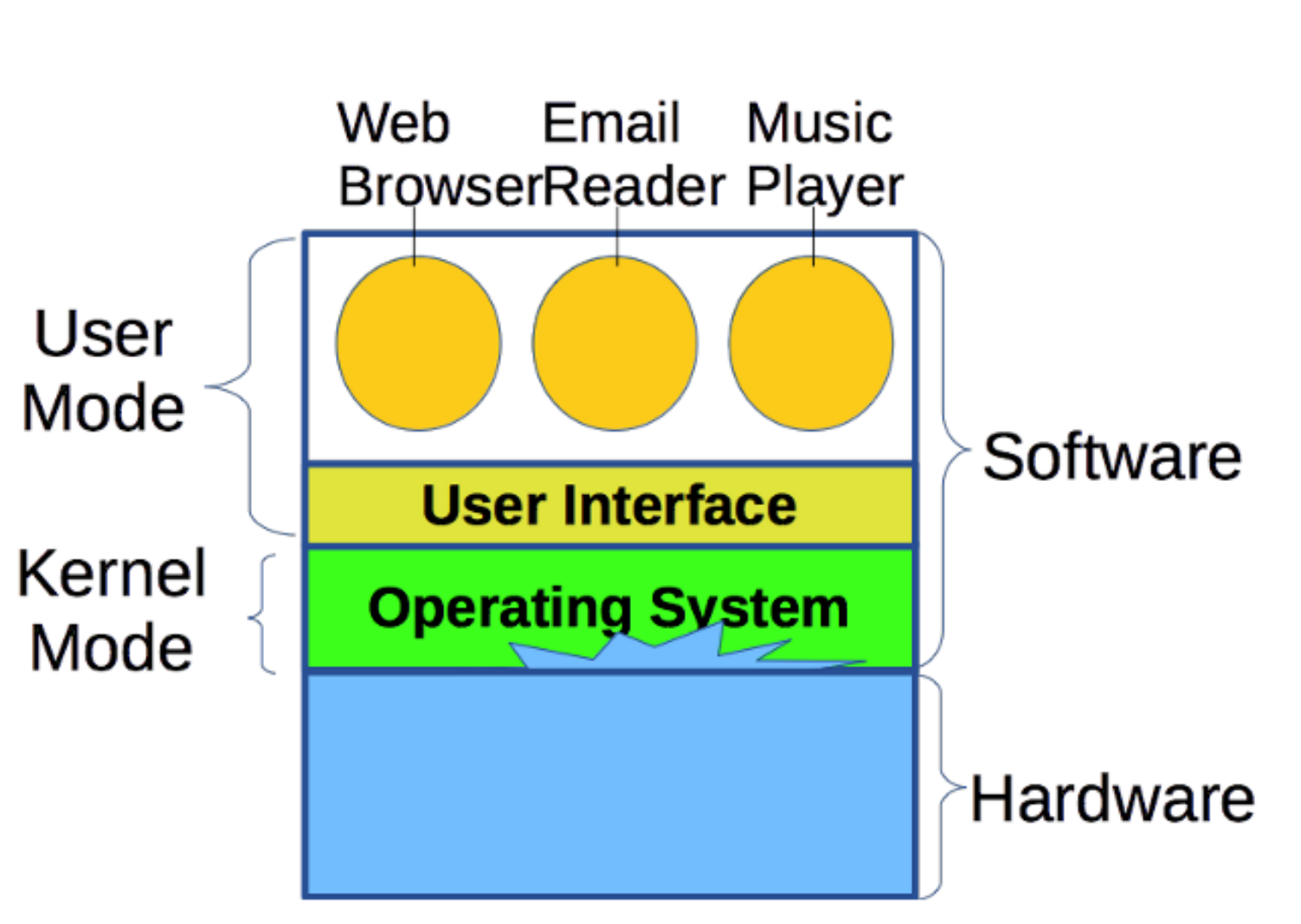
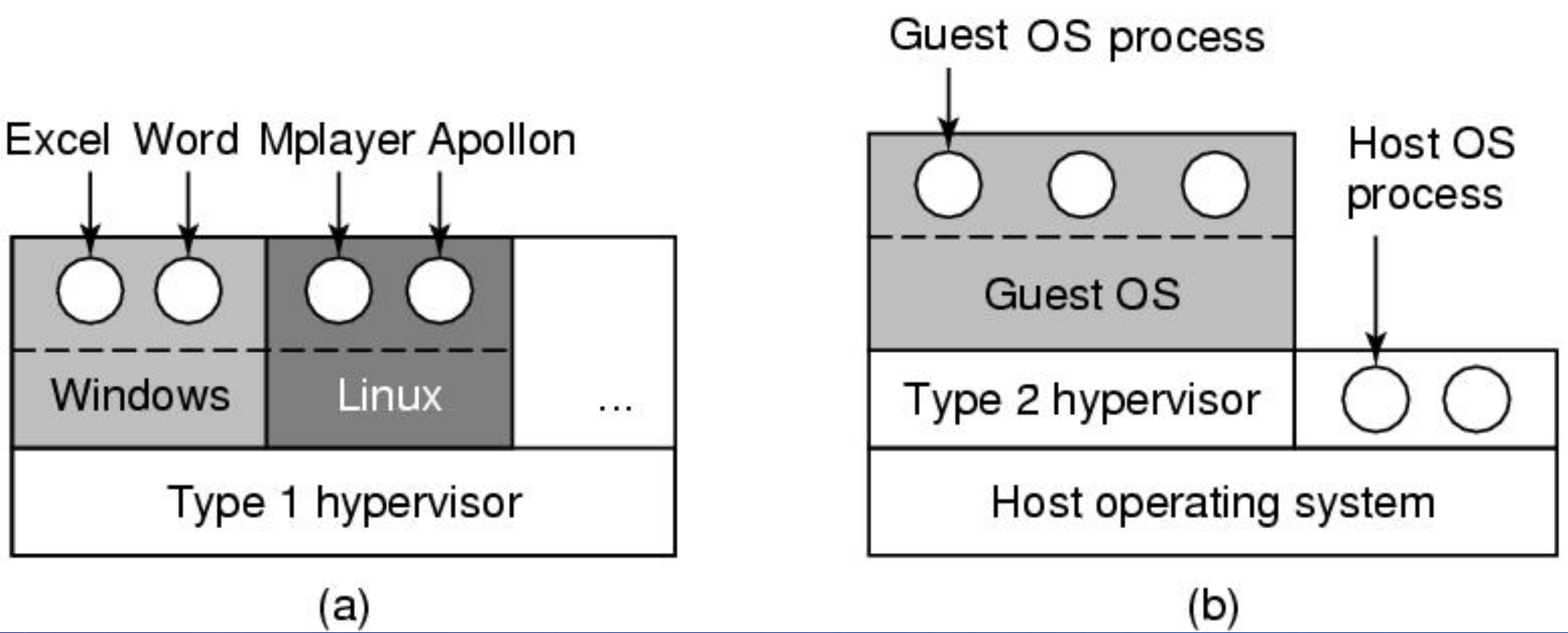
OBJECTIVES

- Layers of Computer
- Virtual Machine
  - Host OS, Guest OS
- Enterprise Operating System
  - Linux kernel based OSes: Ubuntu
- DB Server
  - MySQL, *PostgreSQL, MongoDB*
- DB Client: python

LAYERS OF COMPUTER

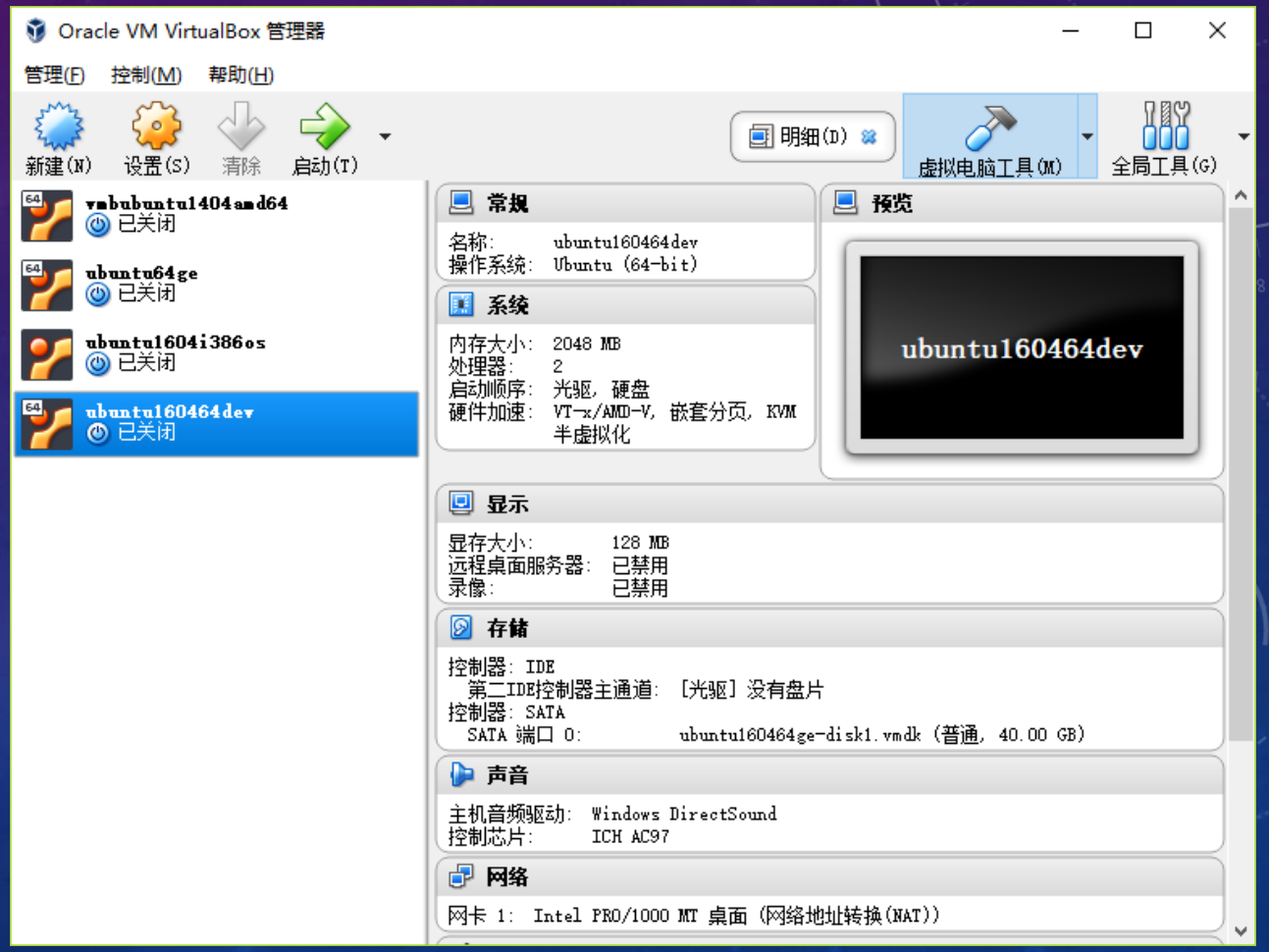


VIRTUAL MACHINE



VIRTUAL MACHINE: HYPERVISOR

- Vmware
- Xen
- Linux KVM
- Virtualbox
  - https://www.virtualbox.org/
- …



REAL FREE OSES

- FreeBSD
- Open Solaris
- Linux kernel based Oses
- …

LINUX KERNEL

User mode	**User applications**	For example, bash, LibreOffice, GIMP, Blender, 0 A.D., Mozilla Firefox, etc.				
	Low-level system components:	**System daemons**: *systemd, runit, logind, networkd, PulseAudio, ...*	**Windowing system**: *X11, Wayland, SurfaceFlinger (Android)*	**Other libraries:** *GTK+, Qt, EFL, SDL, SFML, FLTK, GNUstep*, etc.	**Graphics**: *Mesa, AMD Catalyst, ...*	
	C standard library	`open()`, `exec()`, `sbrk()`, `socket()`, `fopen()`, `calloc()`, ... (up to 2000 subroutines) *glibc* aims to be POSIX/SUS-compatible, *uClibc* targets embedded systems, *bionic* written for Android, etc.				
Kernel mode	**Linux kernel**	`stat`, `splice`, `dup`, `read`, `open`, `ioctl`, `write`, `mmap`, `close`, `exit`, etc. (about 380 system calls) The Linux kernel System Call Interface (SCI, aims to be POSIX/SUS-compatible)				
		Process scheduling subsystem	IPC subsystem	Memory management subsystem	Virtual files subsystem	Network subsystem
		Other components: ALSA, DRI, evdev, LVM, device mapper, Linux Network Scheduler, Netfilter Linux Security Modules: *SELinux*, *TOMOYO*, *AppArmor*, *Smack*				
Hardware (CPU, main memory, data storage devices, etc.)						

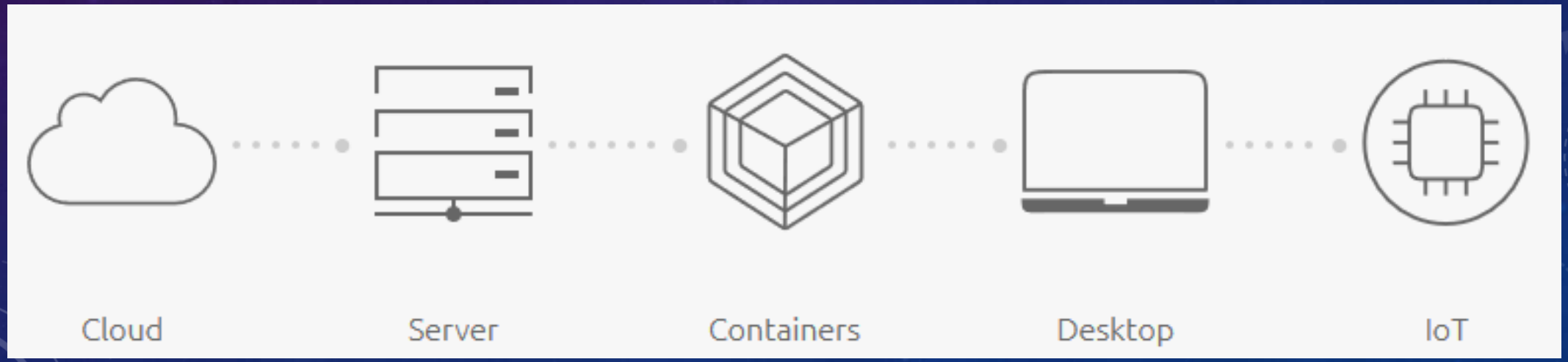
LINUX KERNEL BASED OSES

https://en.wikipedia.org/wiki/Comparison_of_Linux_distributions

- Slackware, CentOS, Chromium OS, Debian, Gentoo Linux, Fedora, Red Hat Enterprise Linux, Scientific Linux, SUSE Linux Enterprise, Tiny Core Linux, Ubuntu
- …

UBUNTU

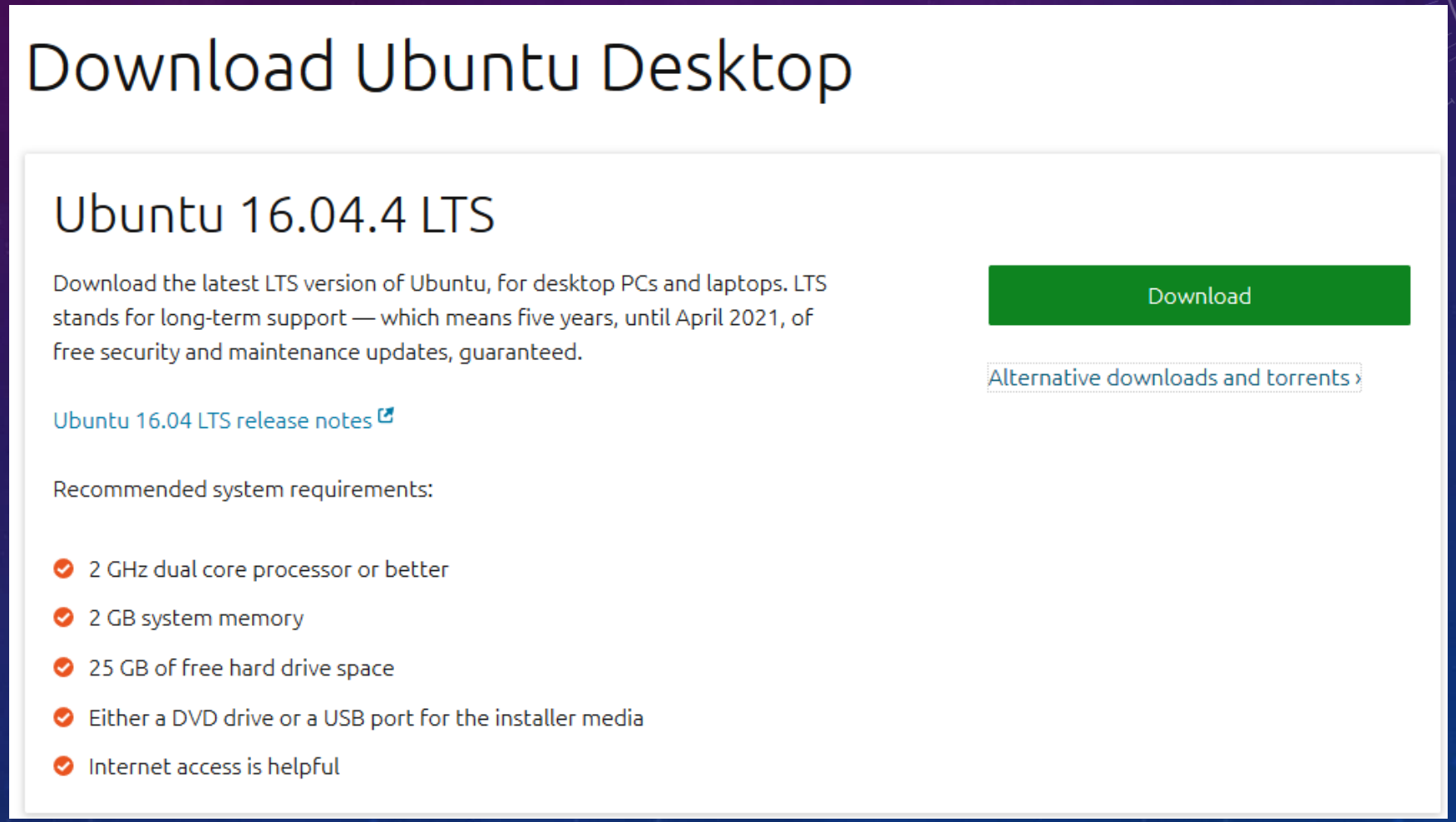
- Ubuntu is an open source software operating system that runs from the desktop, to the cloud, to all your internet connected things



UBUNTU

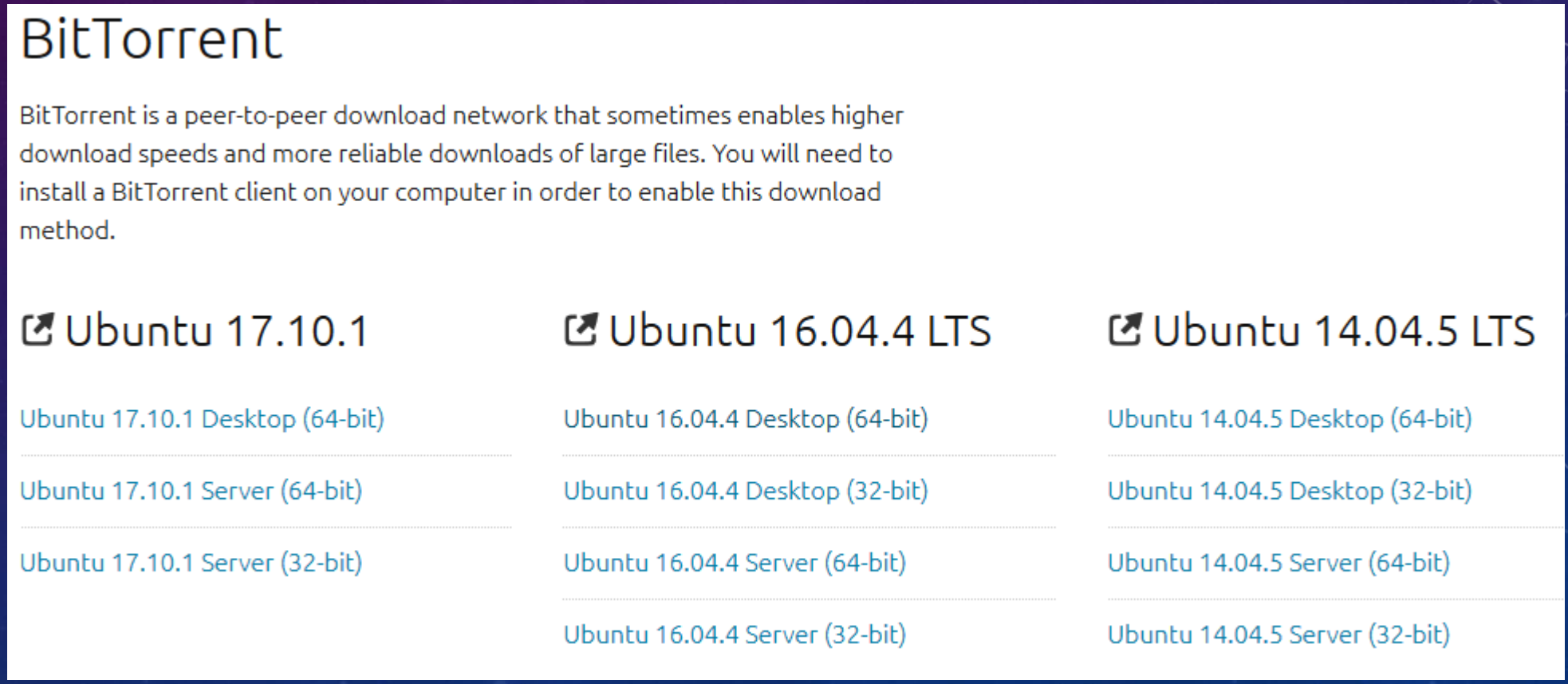
ubuntu-16.04.4-desktop-amd64.iso

- https://www.ubuntu.com/download/desktop



UBUNTU: BITTORRENT

- https://www.ubuntu.com/download/alternative-downloads



BitTorrent

BitTorrent is a peer-to-peer download network that sometimes enables higher download speeds and more reliable downloads of large files. You will need to install a BitTorrent client on your computer in order to enable this download method.

Ubuntu 17.10.1

Ubuntu 17.10.1 Desktop (64-bit)

Ubuntu 17.10.1 Server (64-bit)

Ubuntu 17.10.1 Server (32-bit)

Ubuntu 16.04.4 LTS

Ubuntu 16.04.4 Desktop (64-bit)

Ubuntu 16.04.4 Desktop (32-bit)

Ubuntu 16.04.4 Server (64-bit)

Ubuntu 16.04.4 Server (32-bit)

Ubuntu 14.04.5 LTS

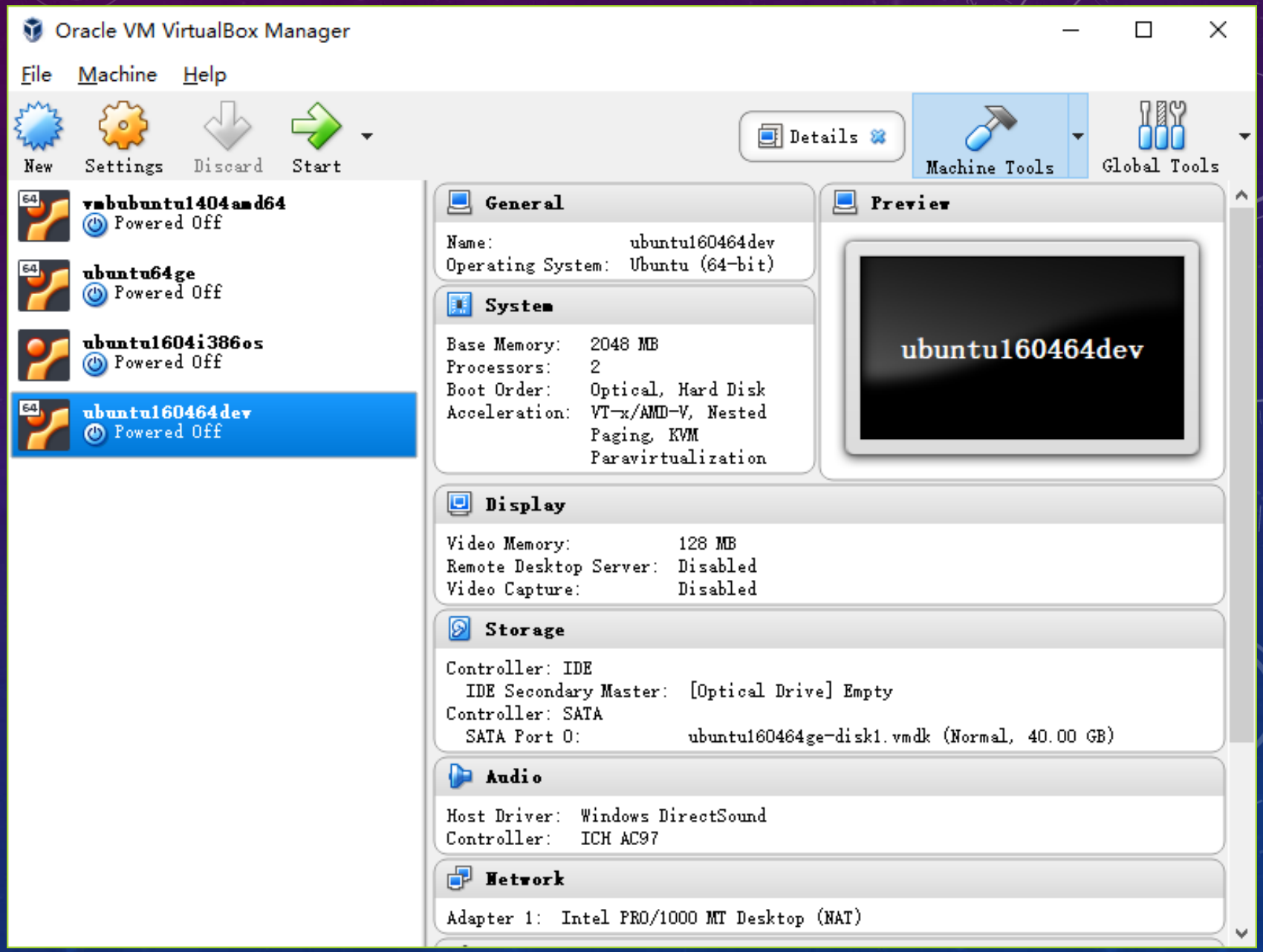
Ubuntu 14.04.5 Desktop (64-bit)

Ubuntu 14.04.5 Desktop (32-bit)

Ubuntu 14.04.5 Server (64-bit)

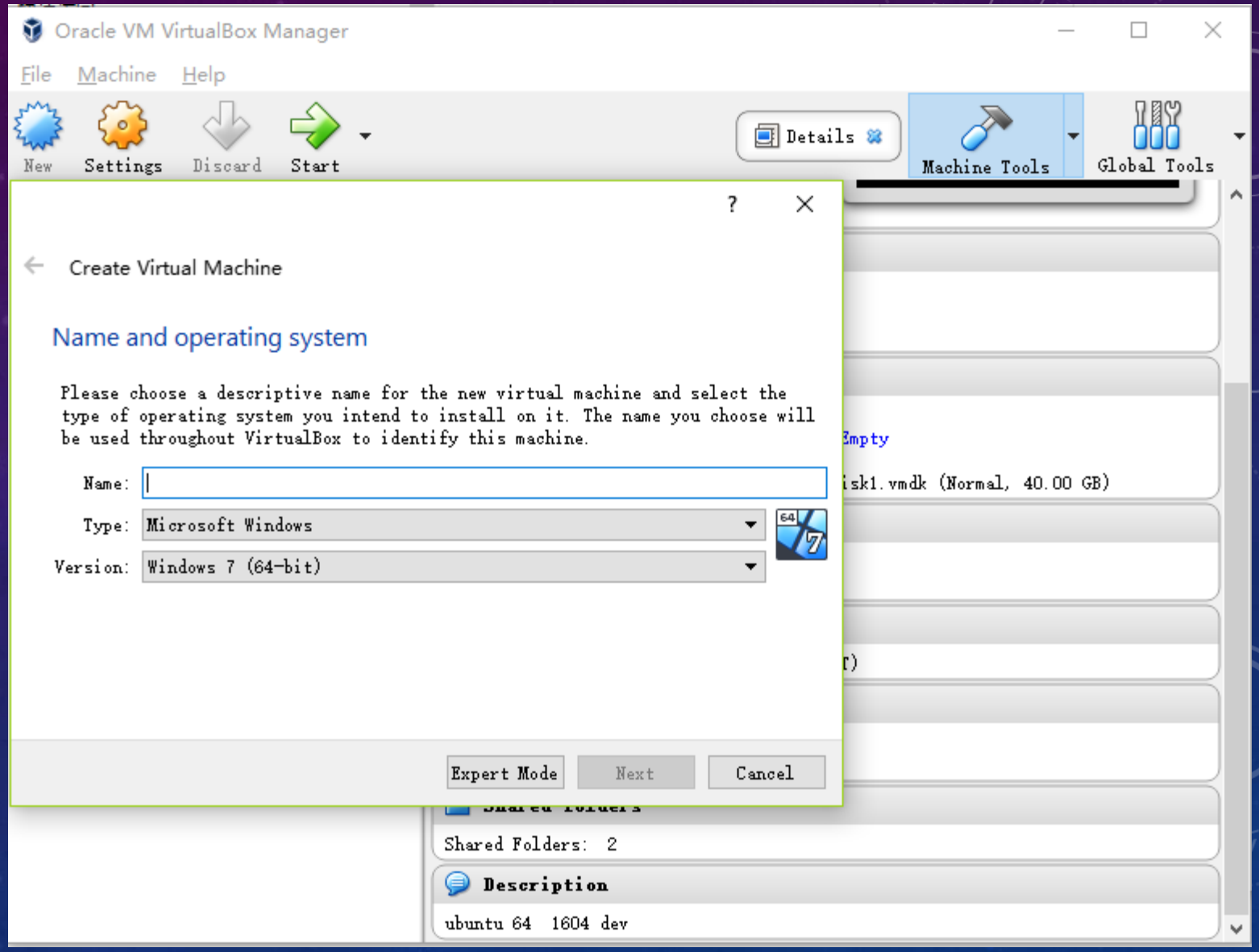
Ubuntu 14.04.5 Server (32-bit)

CREATE A GUEST UBUNTU OS IN VIRTUALBOX



CREATE A GUEST UBUNTU OS IN VIRTUALBOX

- Expert Mode



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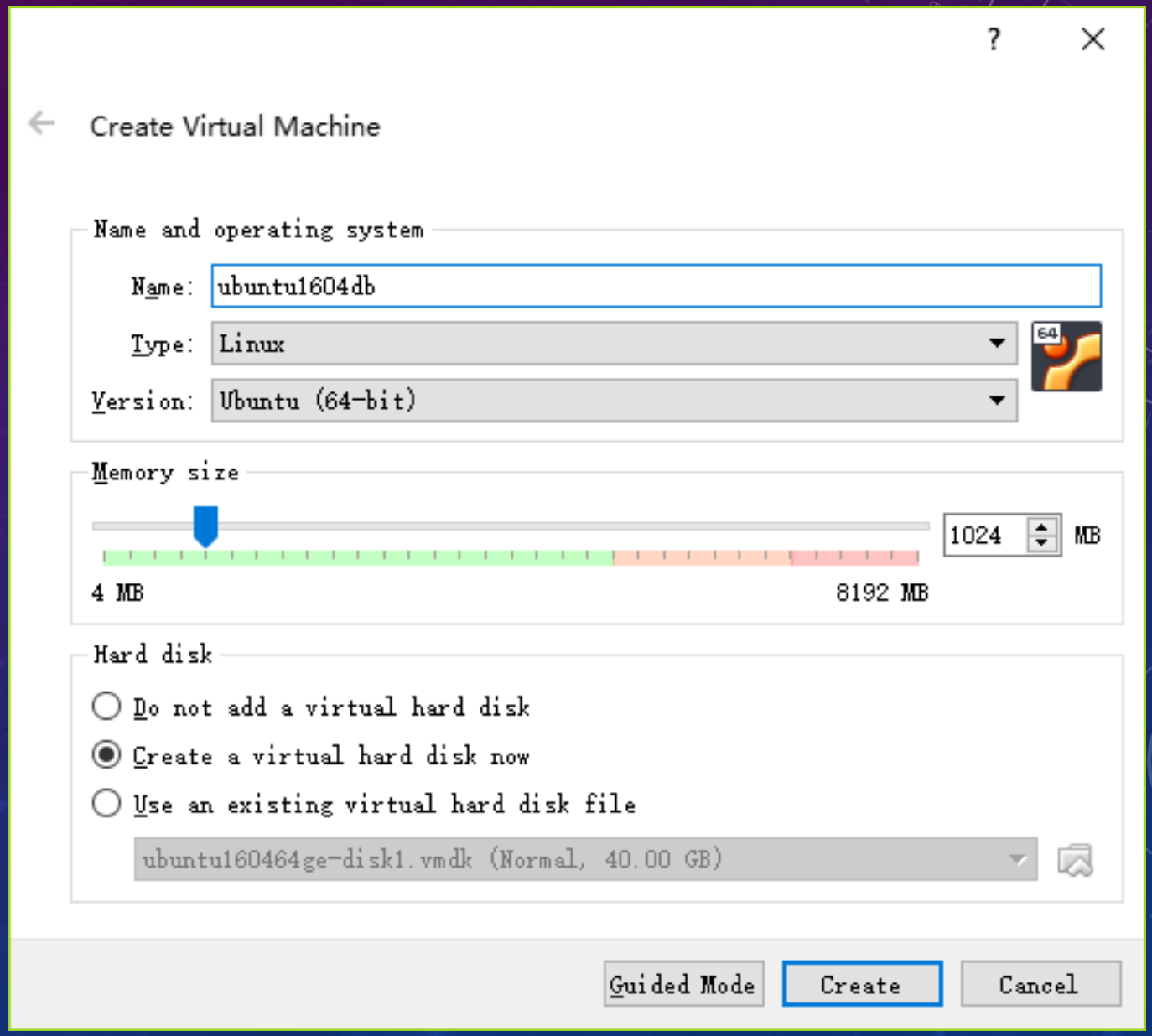

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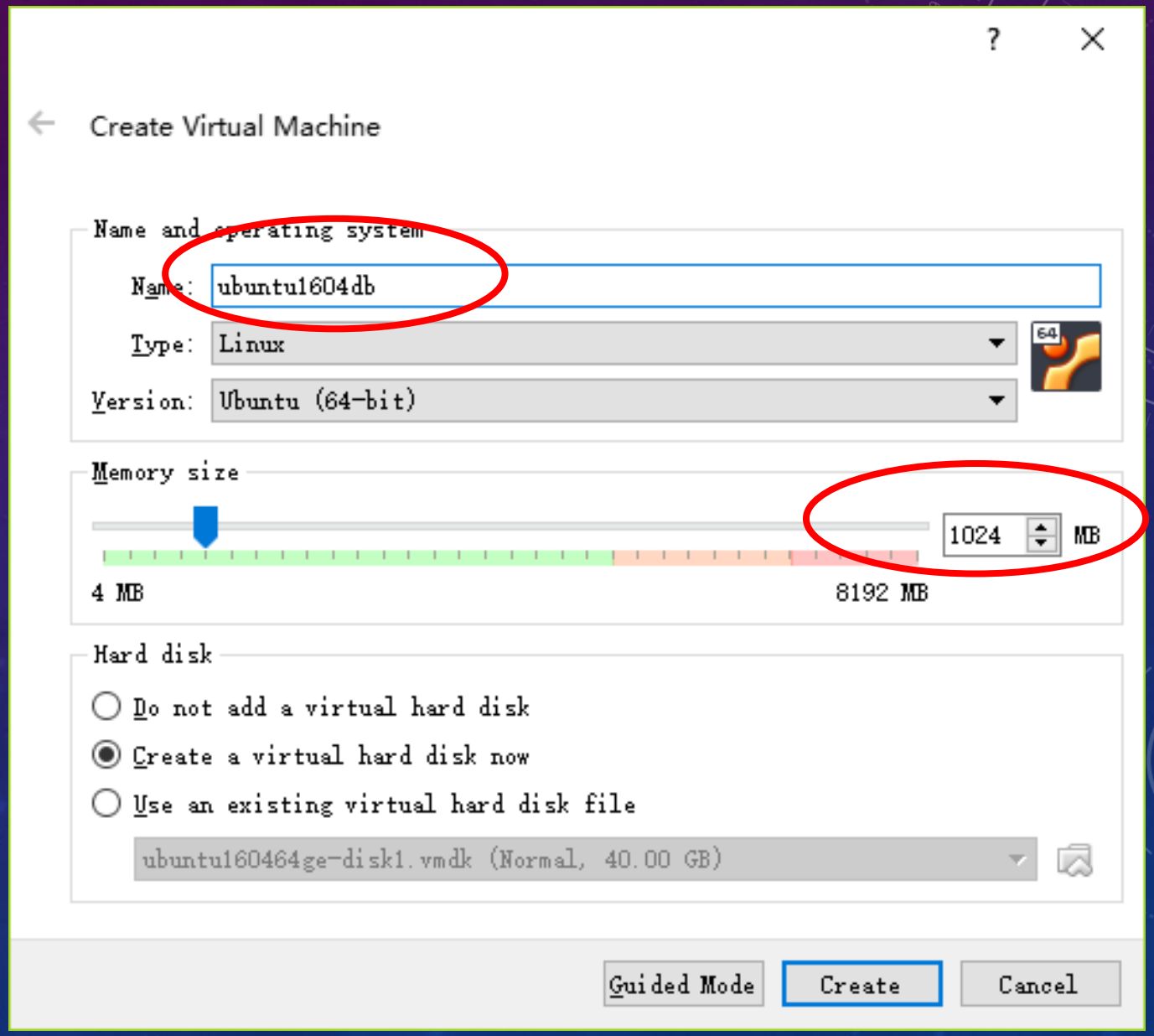

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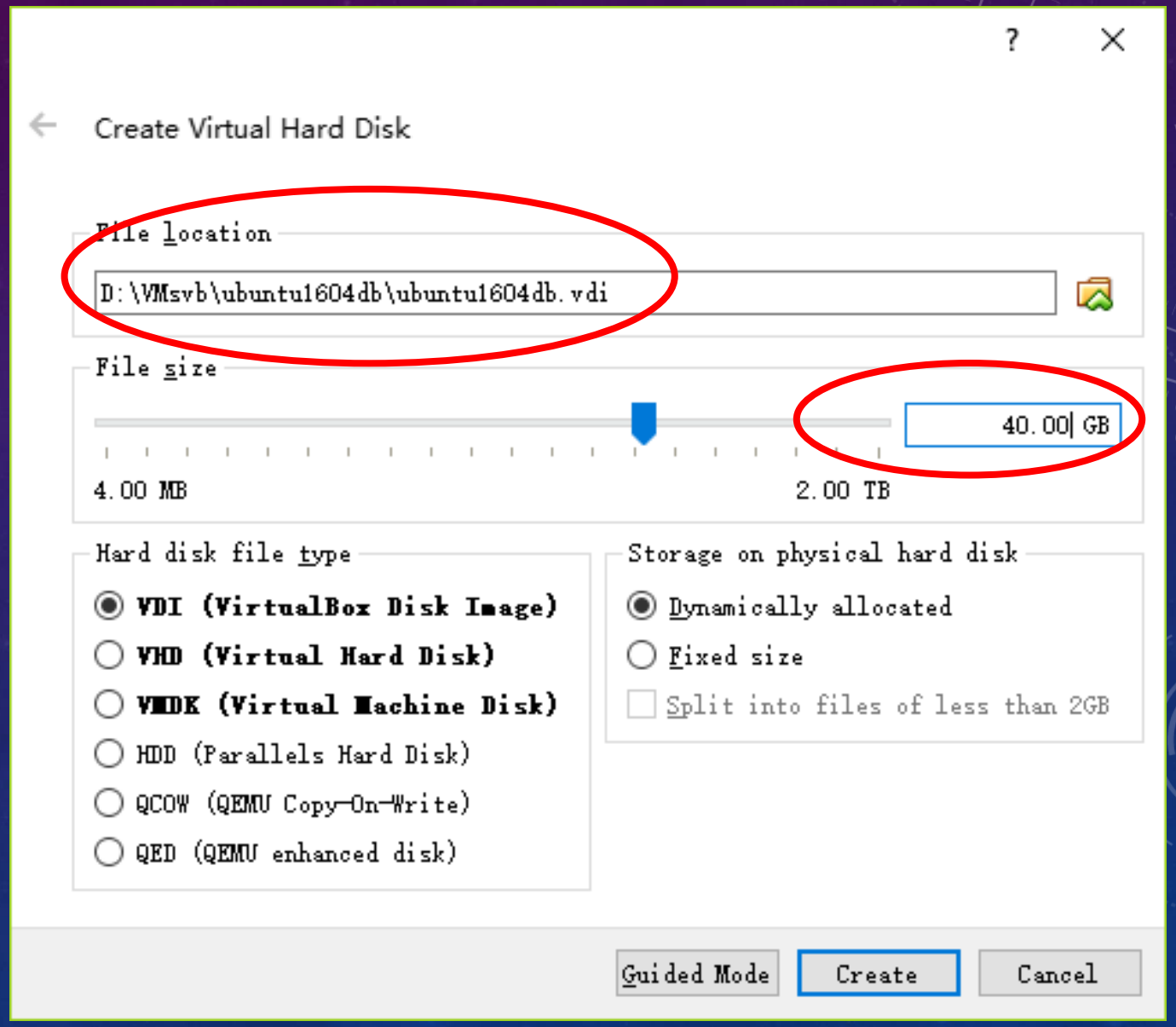

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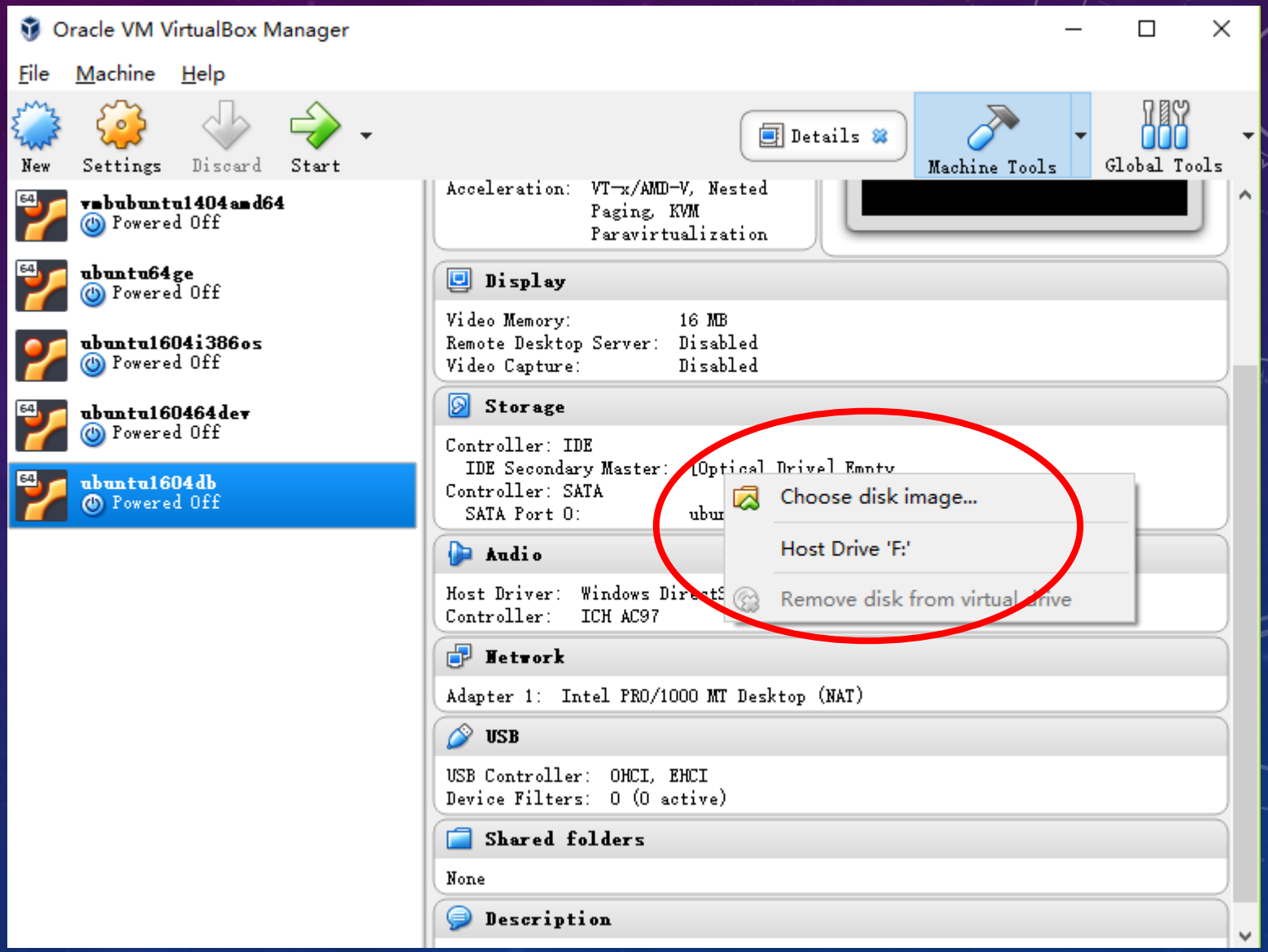

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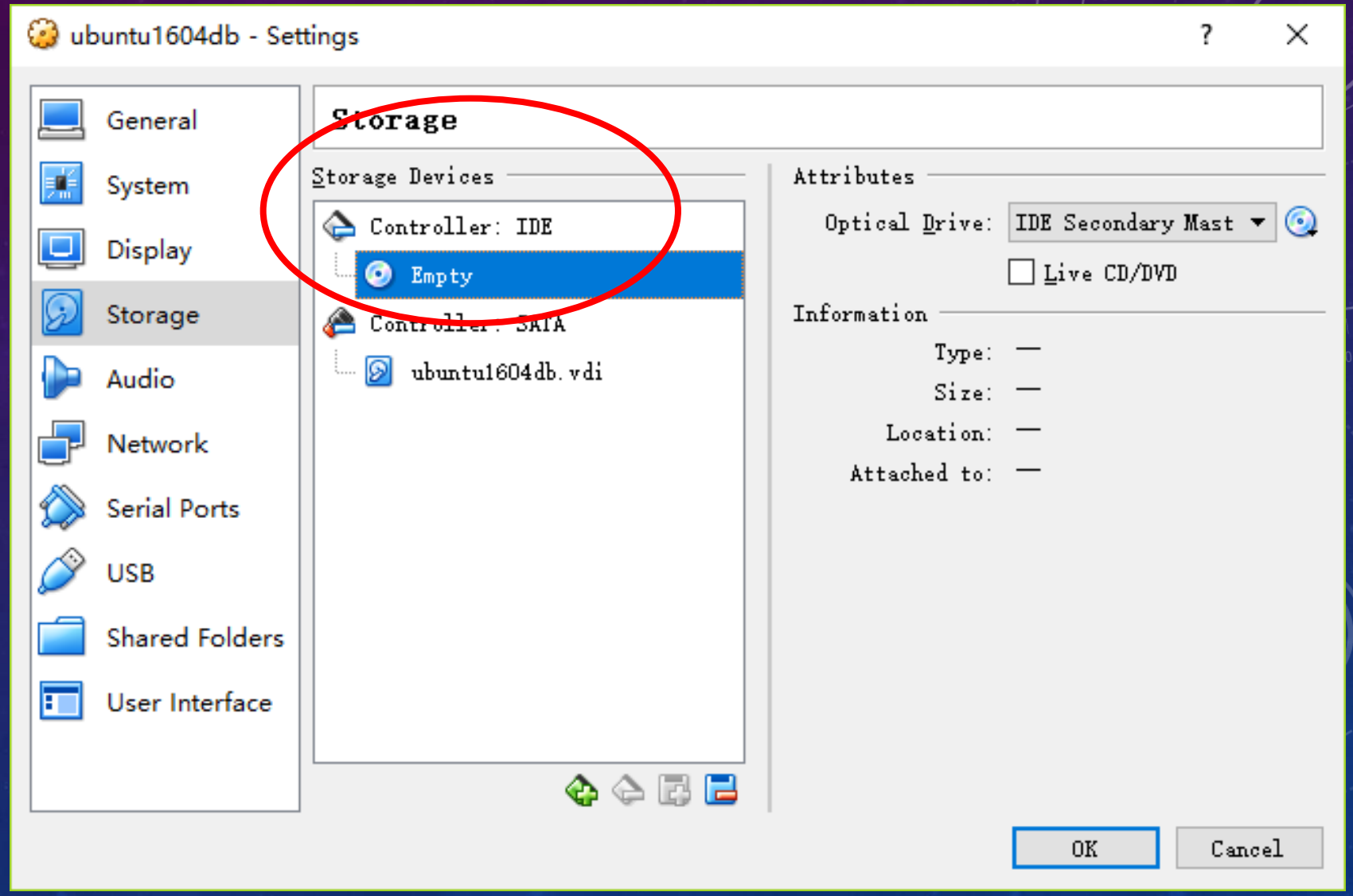
- Expert Mode



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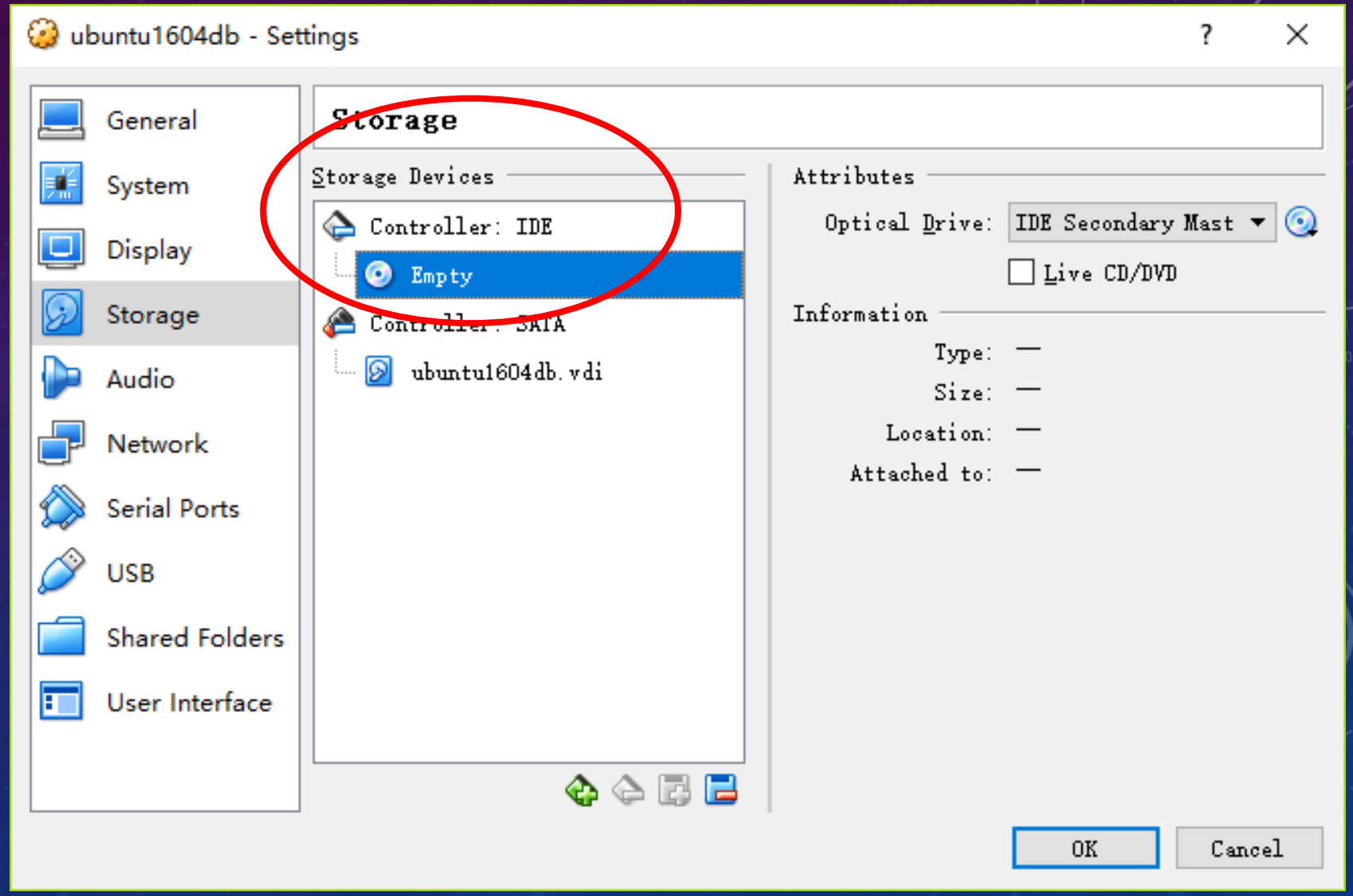

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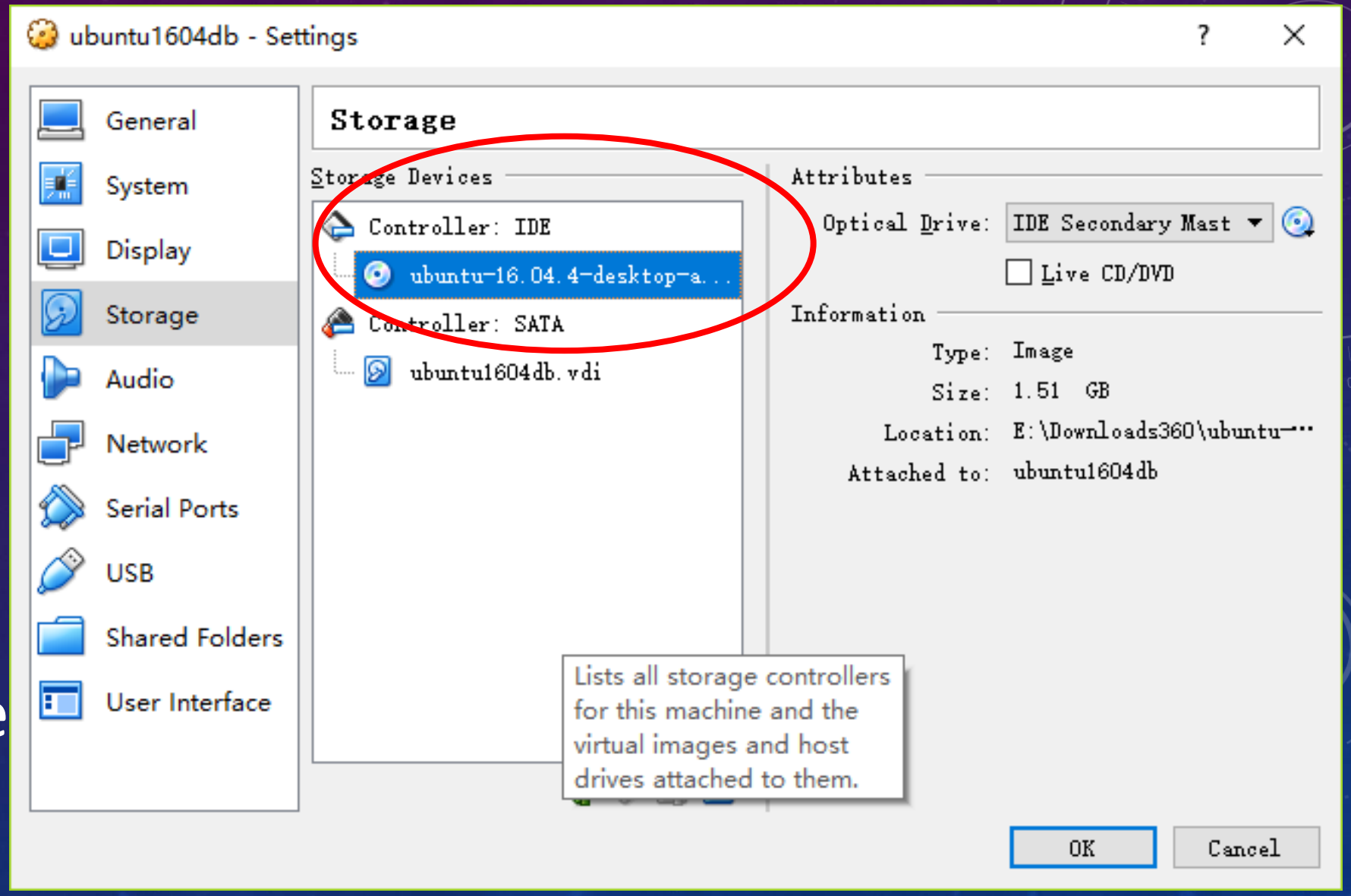

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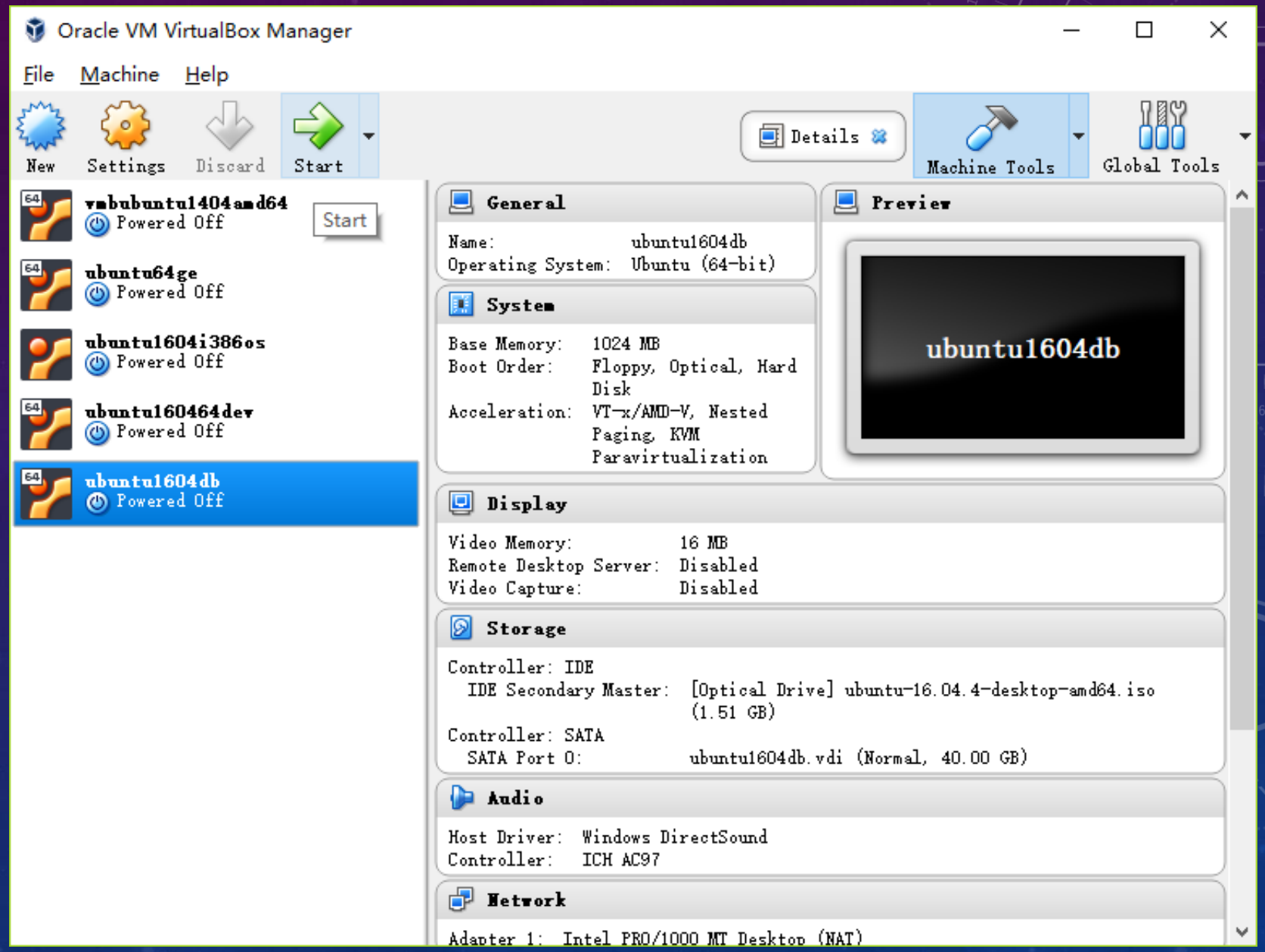
- Expert Mode

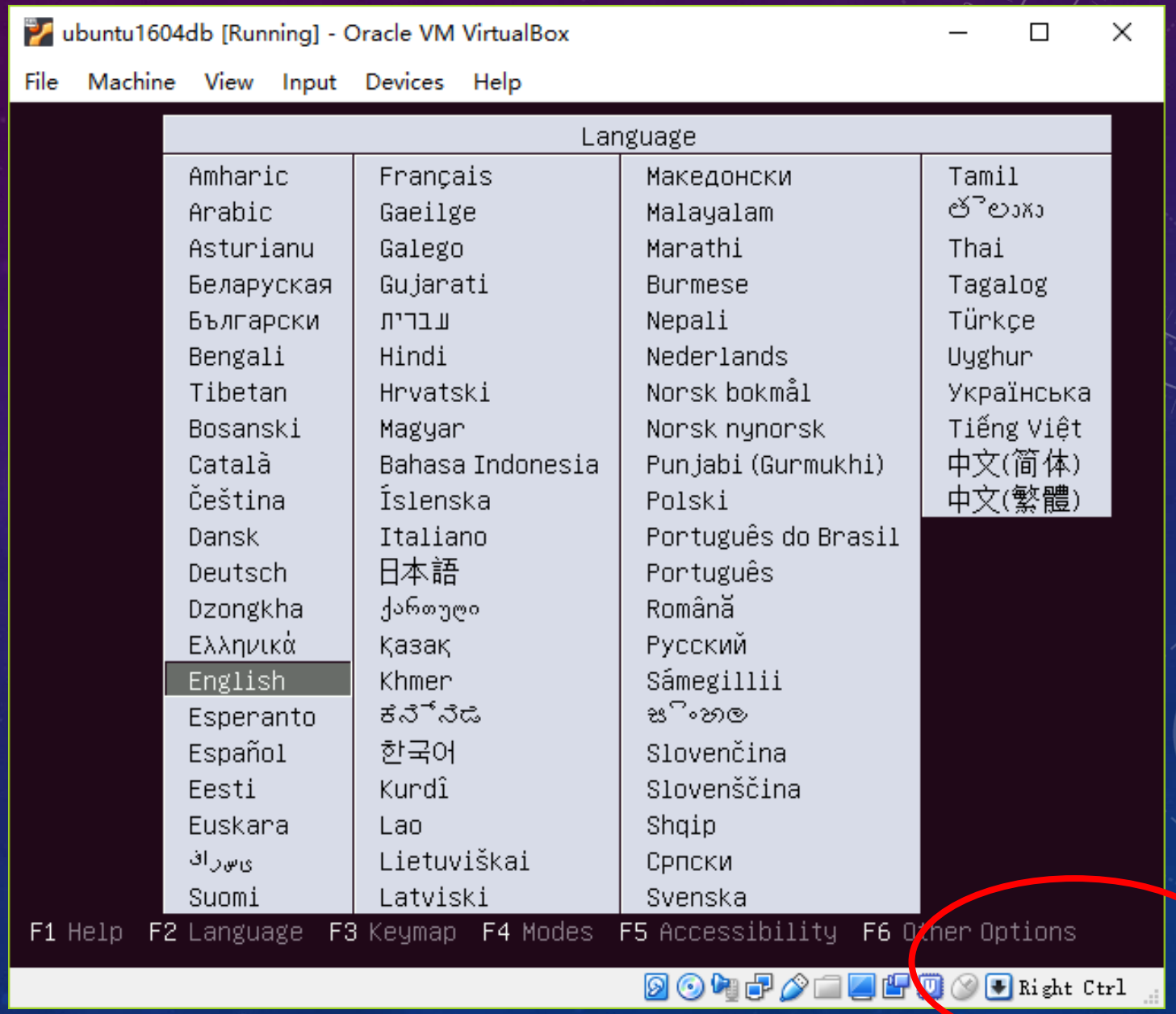


INSTALLING UBUNTU

- Installing Ubuntu
- Post-Installation Configuration

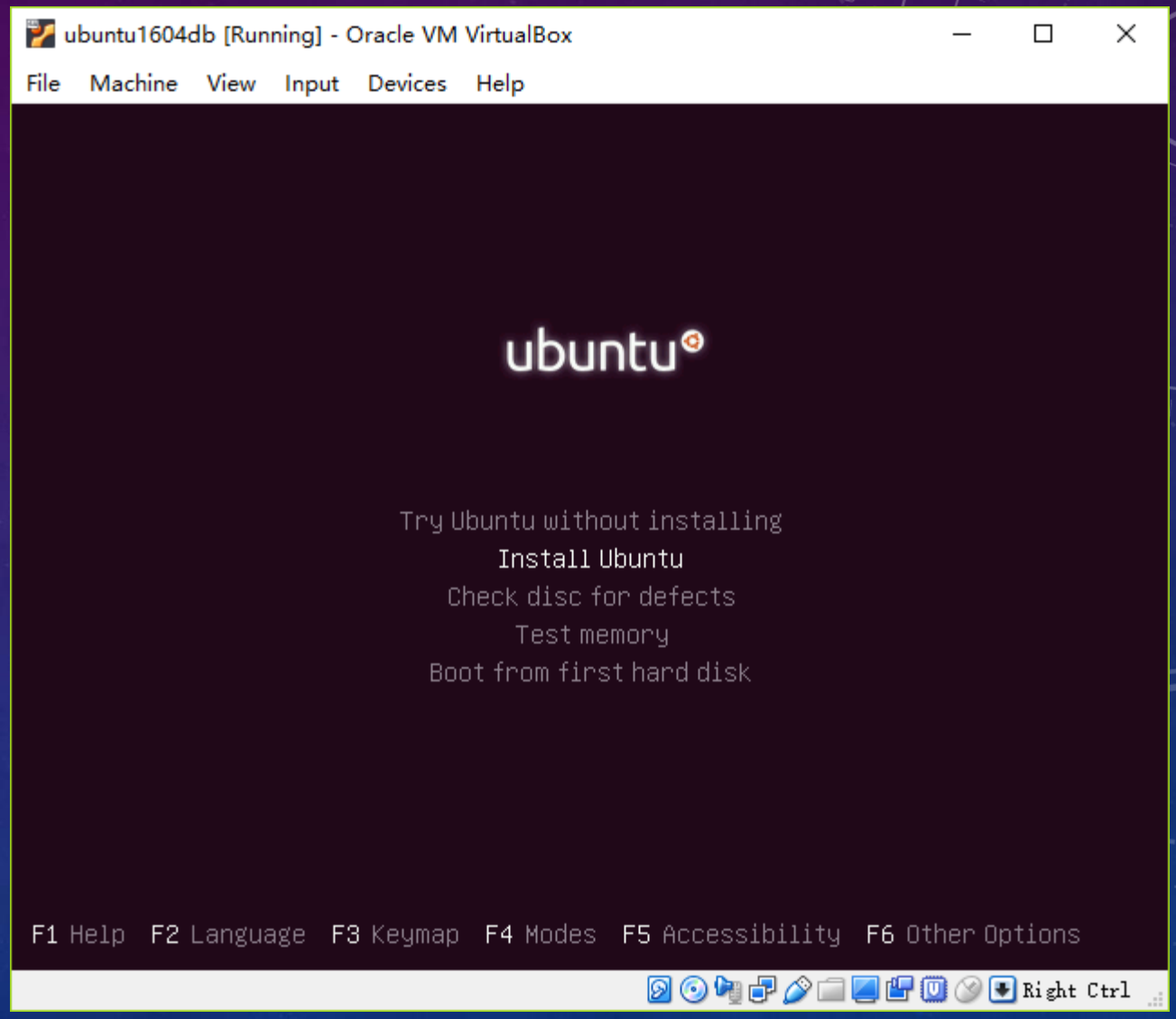
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Hot key
  - Right Ctrl

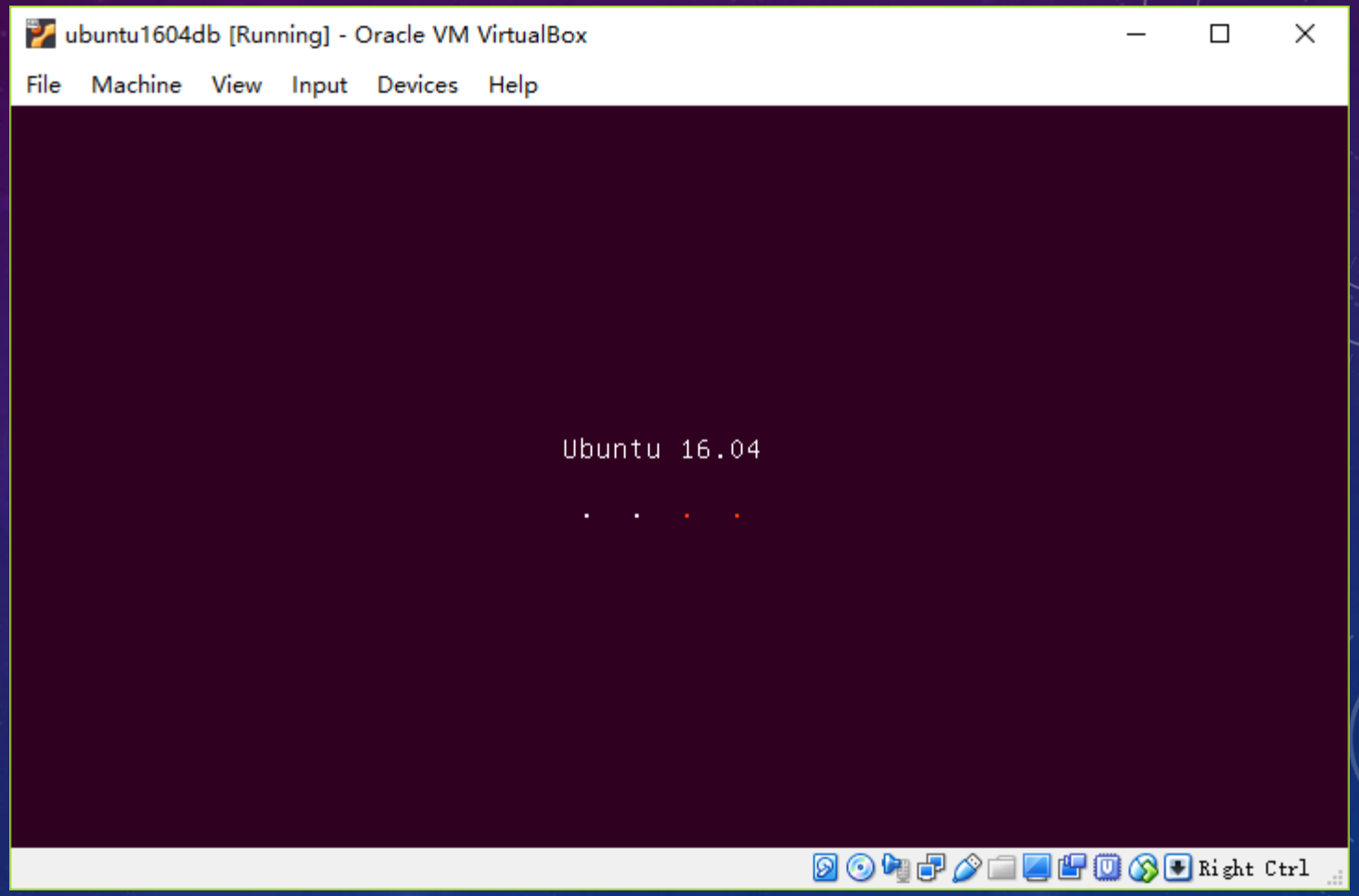


INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Select the second line

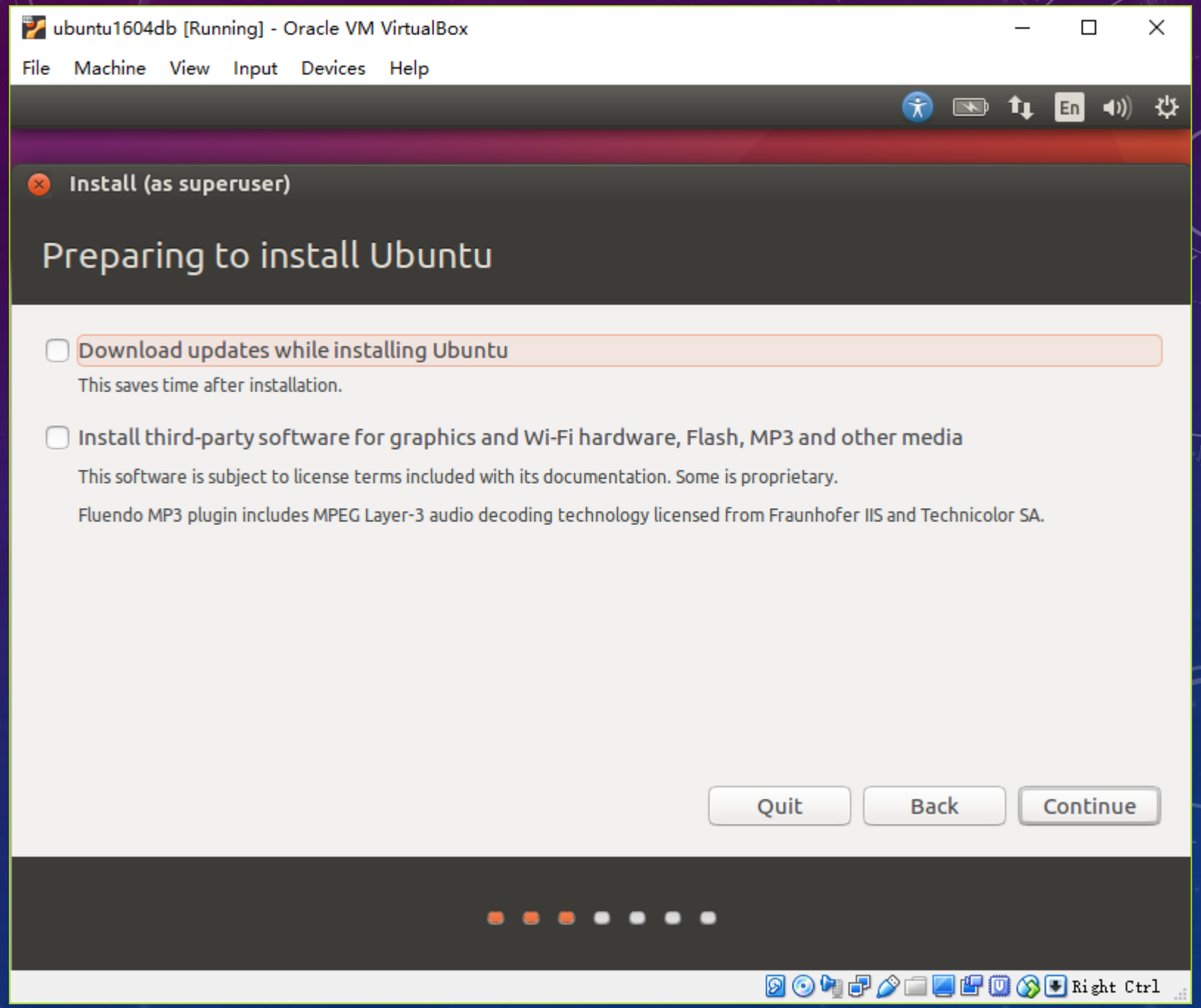


INSTALL A GUEST UBUNTU OS IN VIRTUALBOX



INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Default Selection



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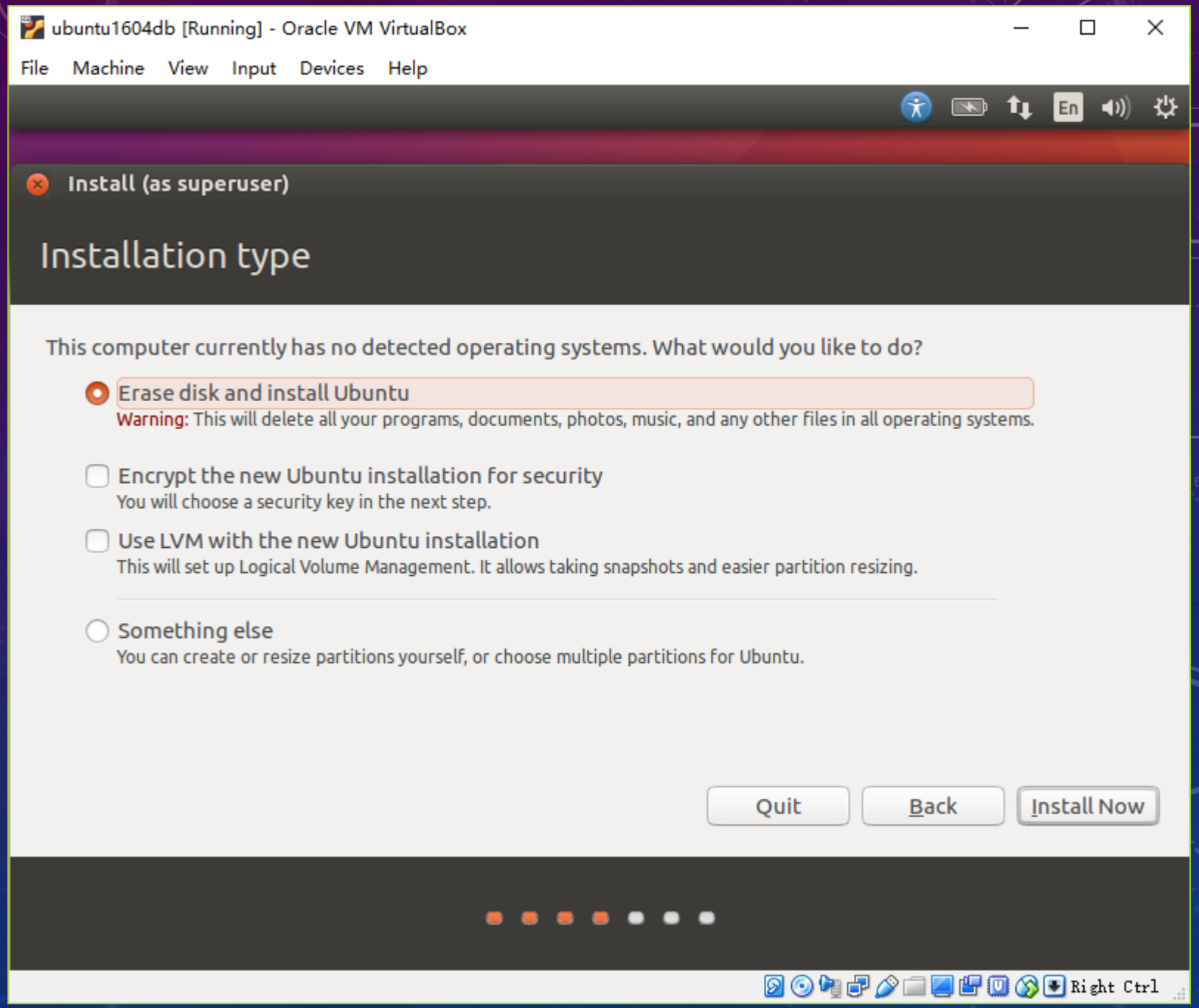
- Default Selection



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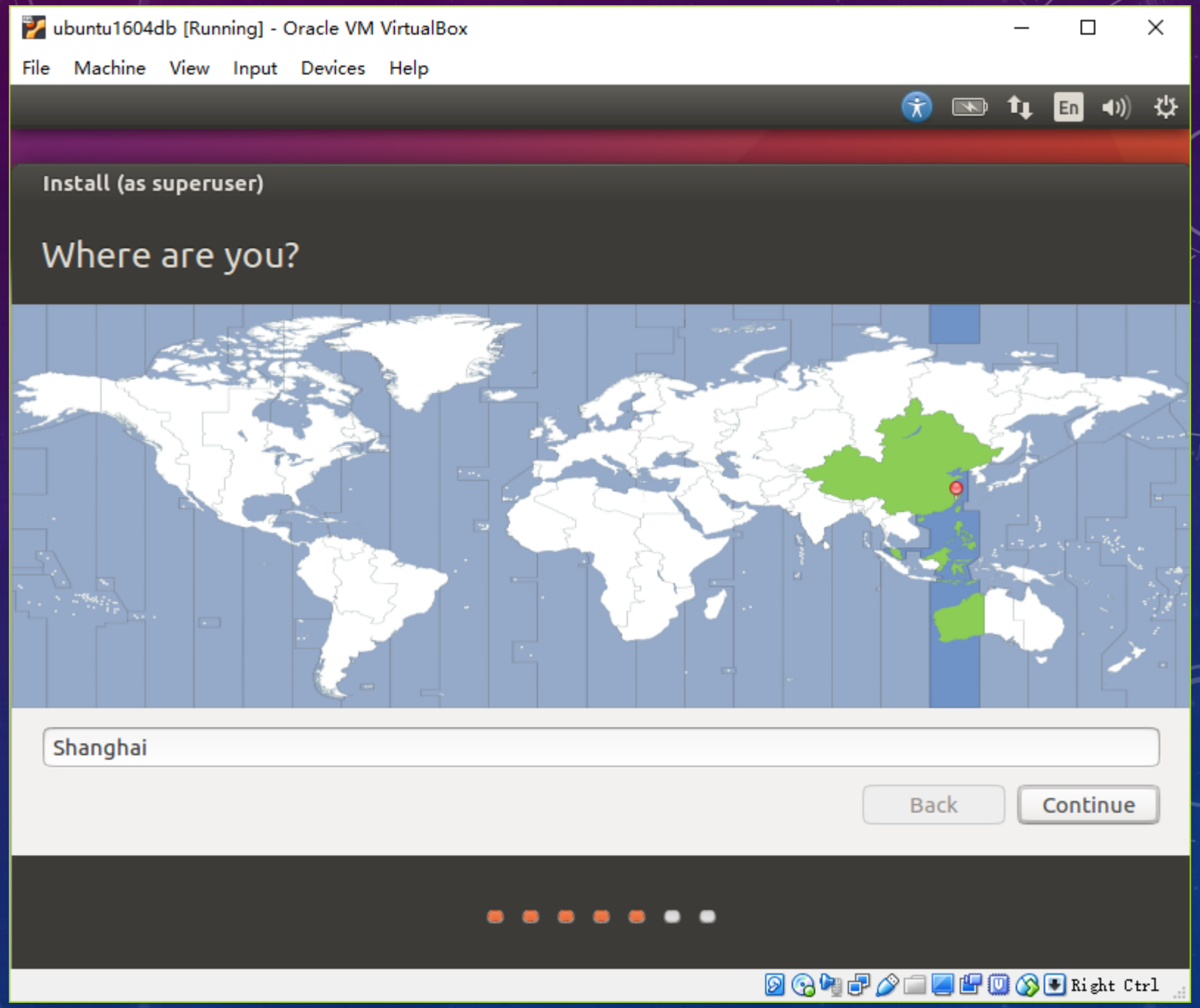
- Default Selection



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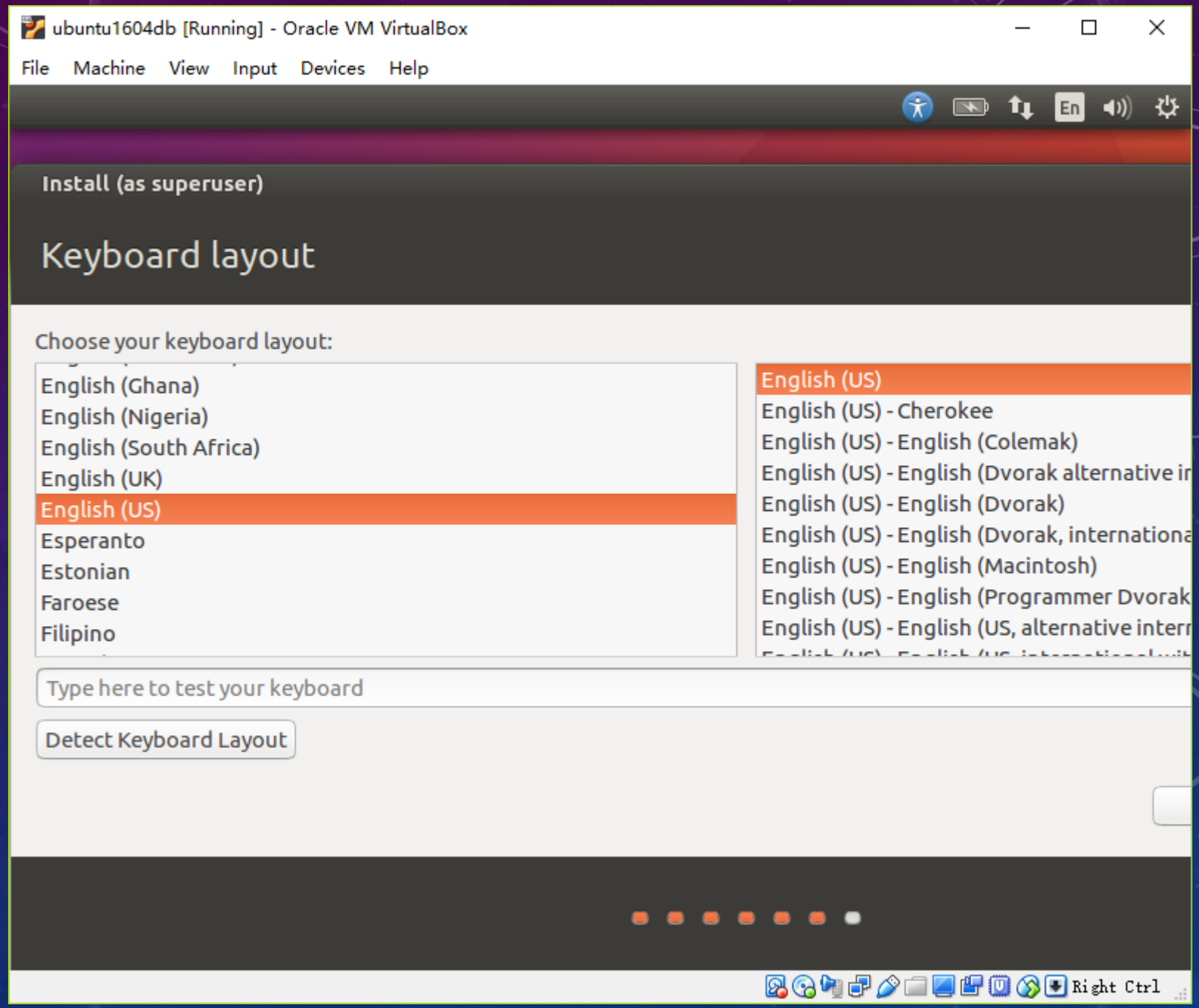
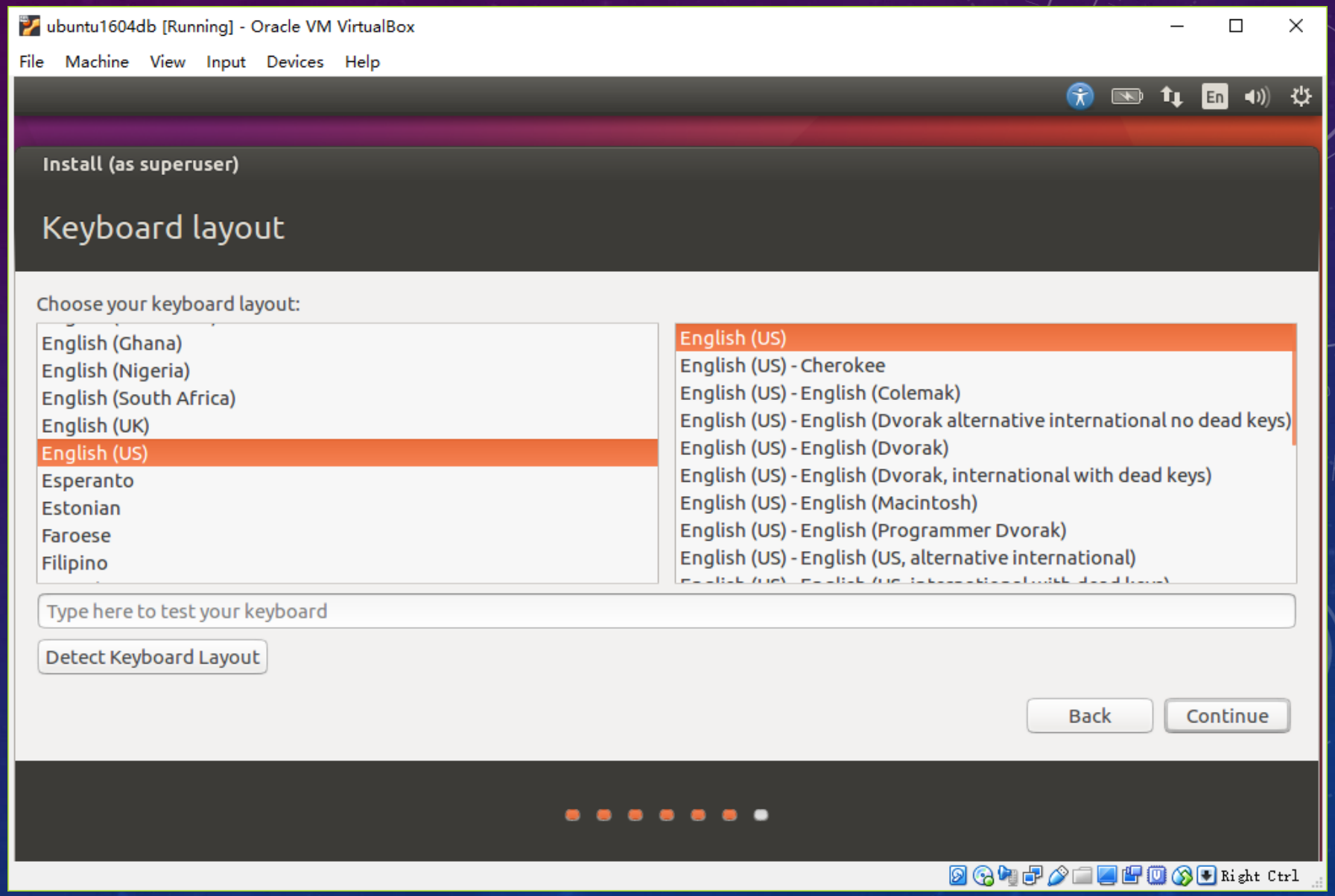
- Default Selection



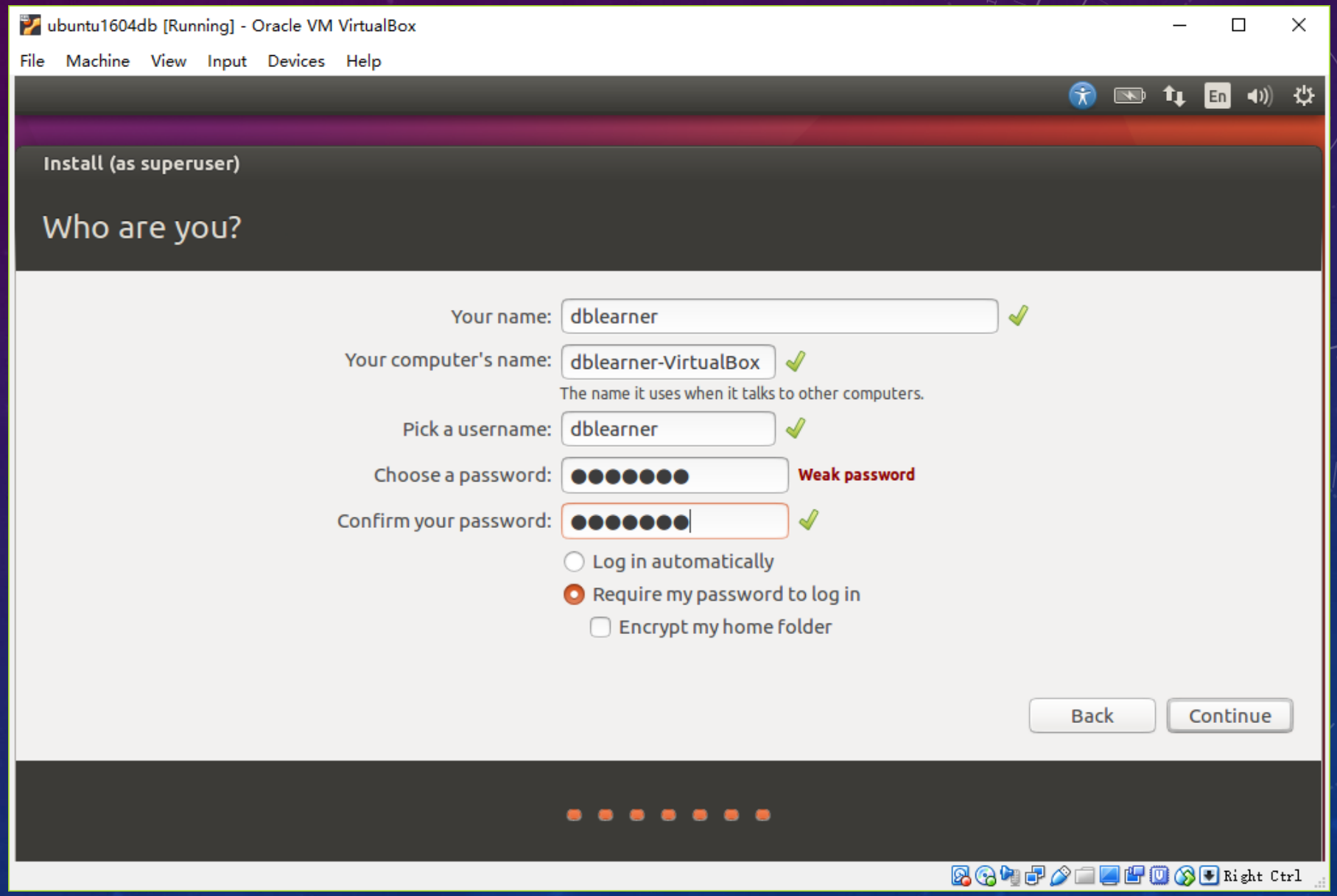
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Default Selection



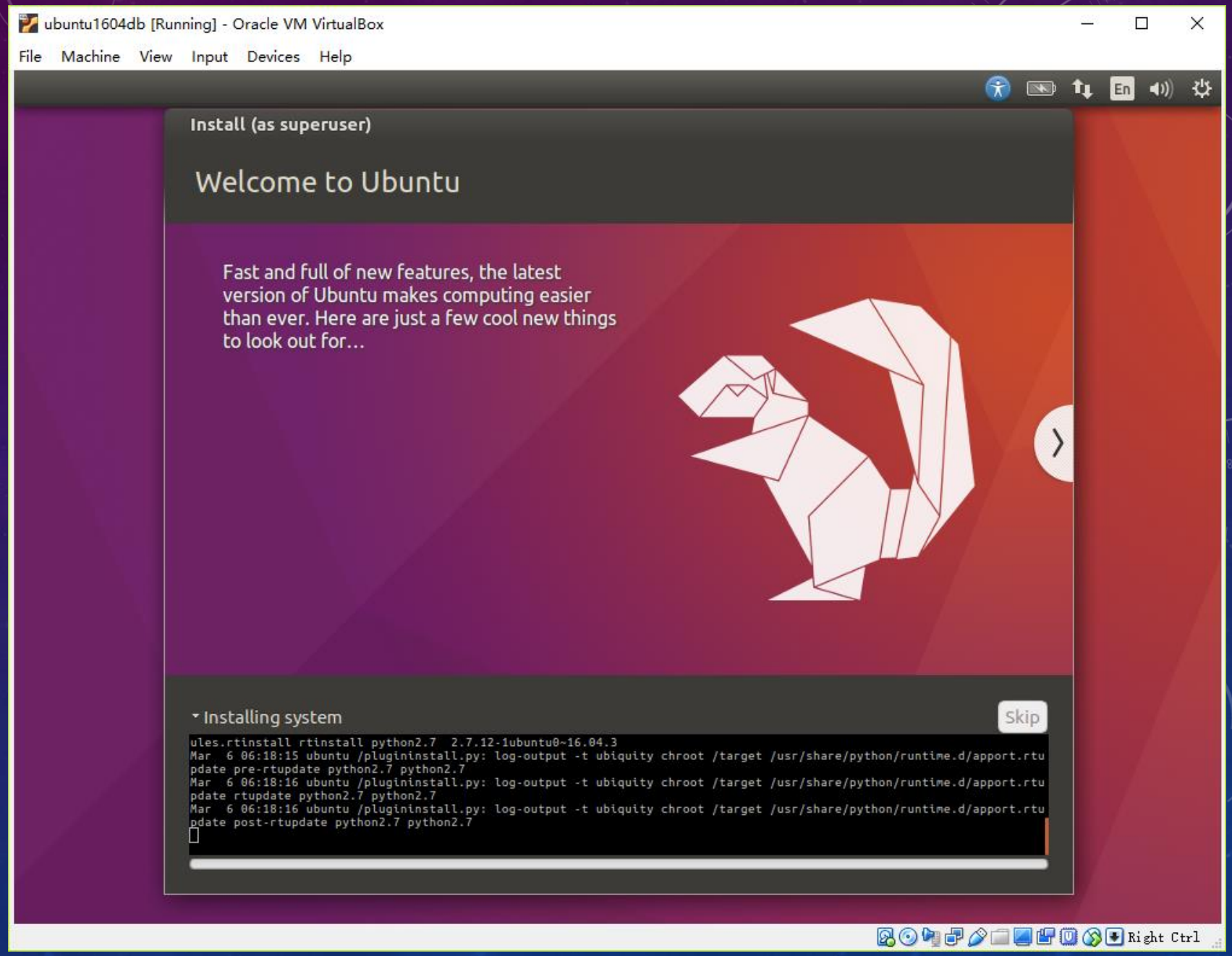
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Your name
- Your pwd



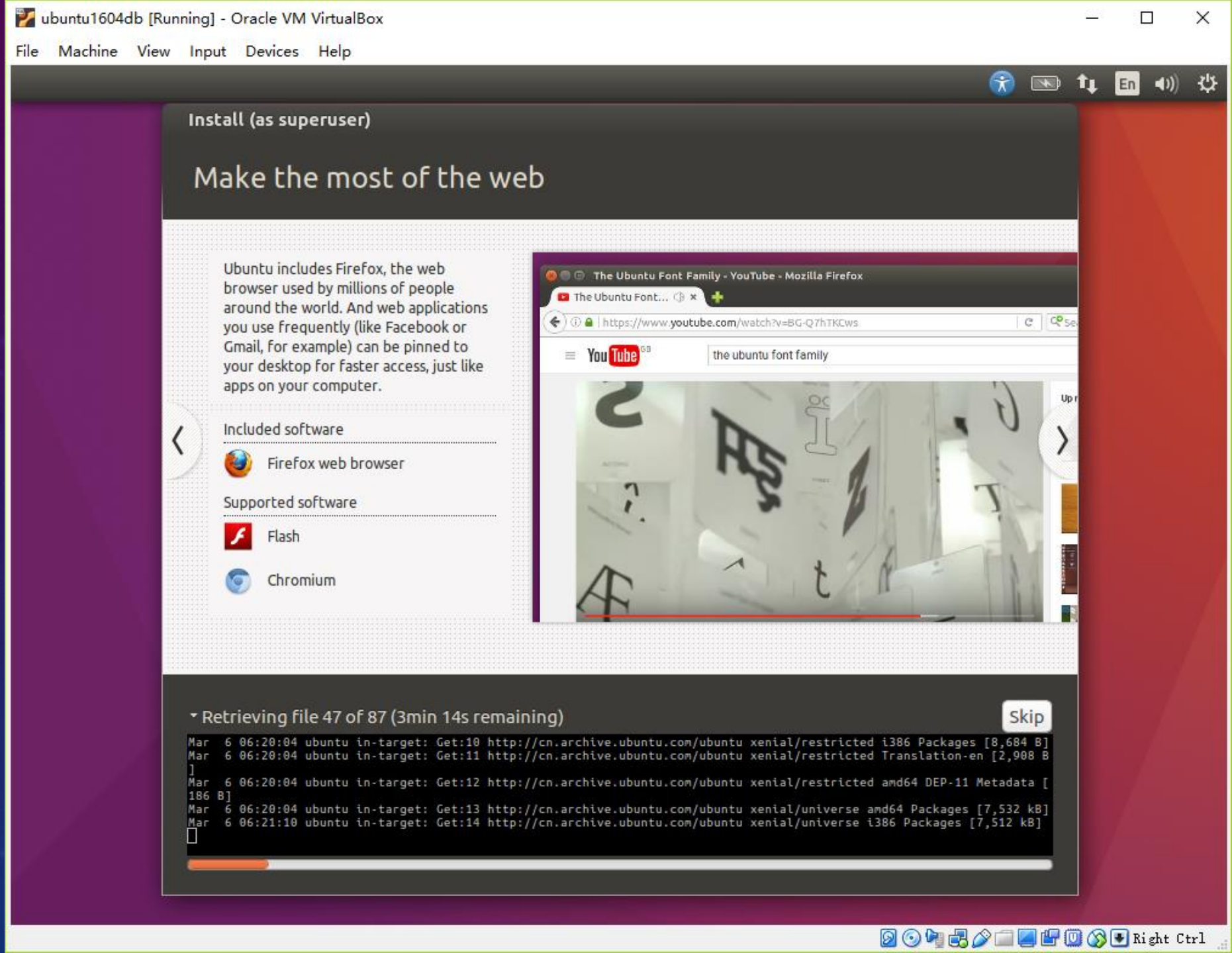
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Wait …



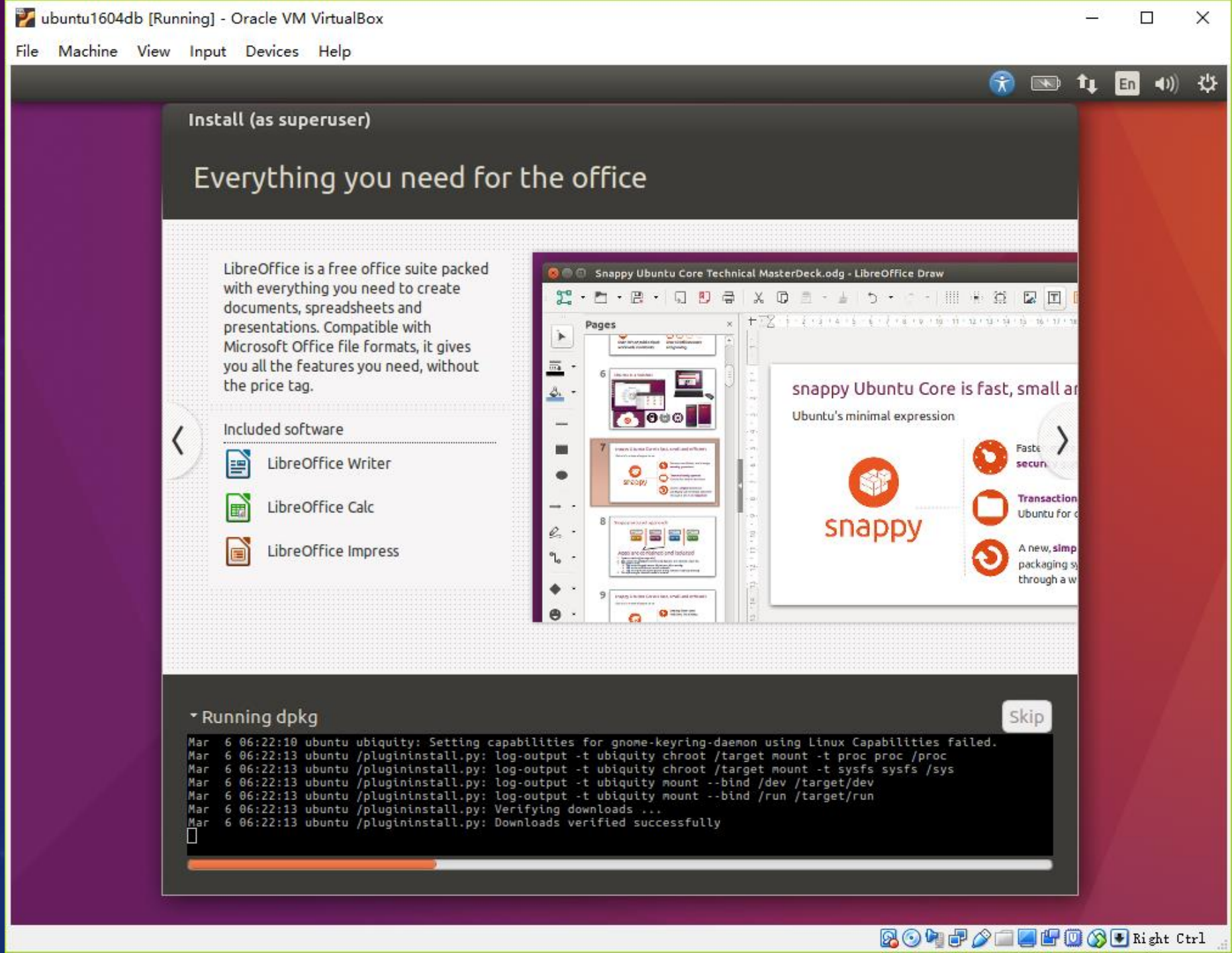
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Wait …



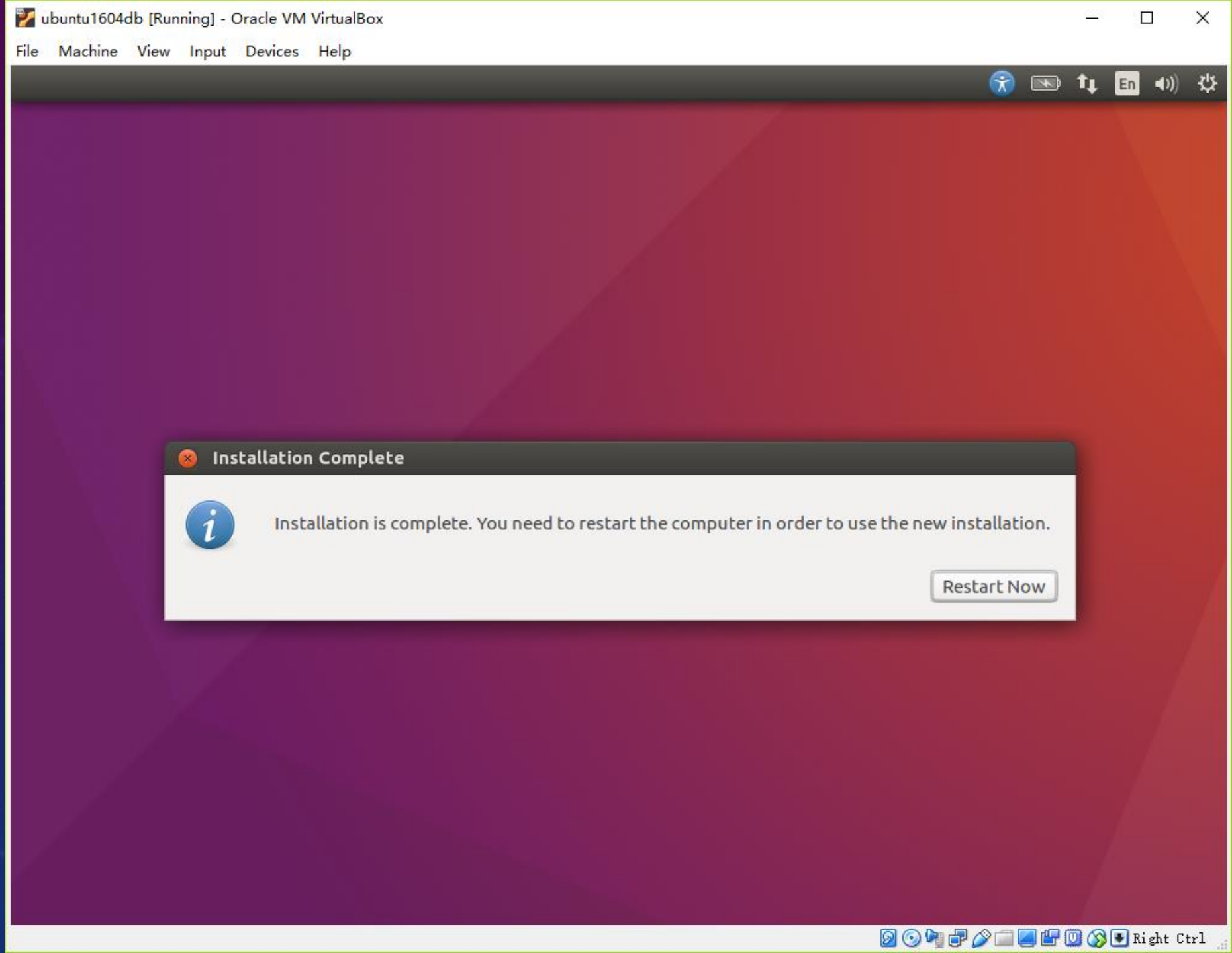
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Wait …



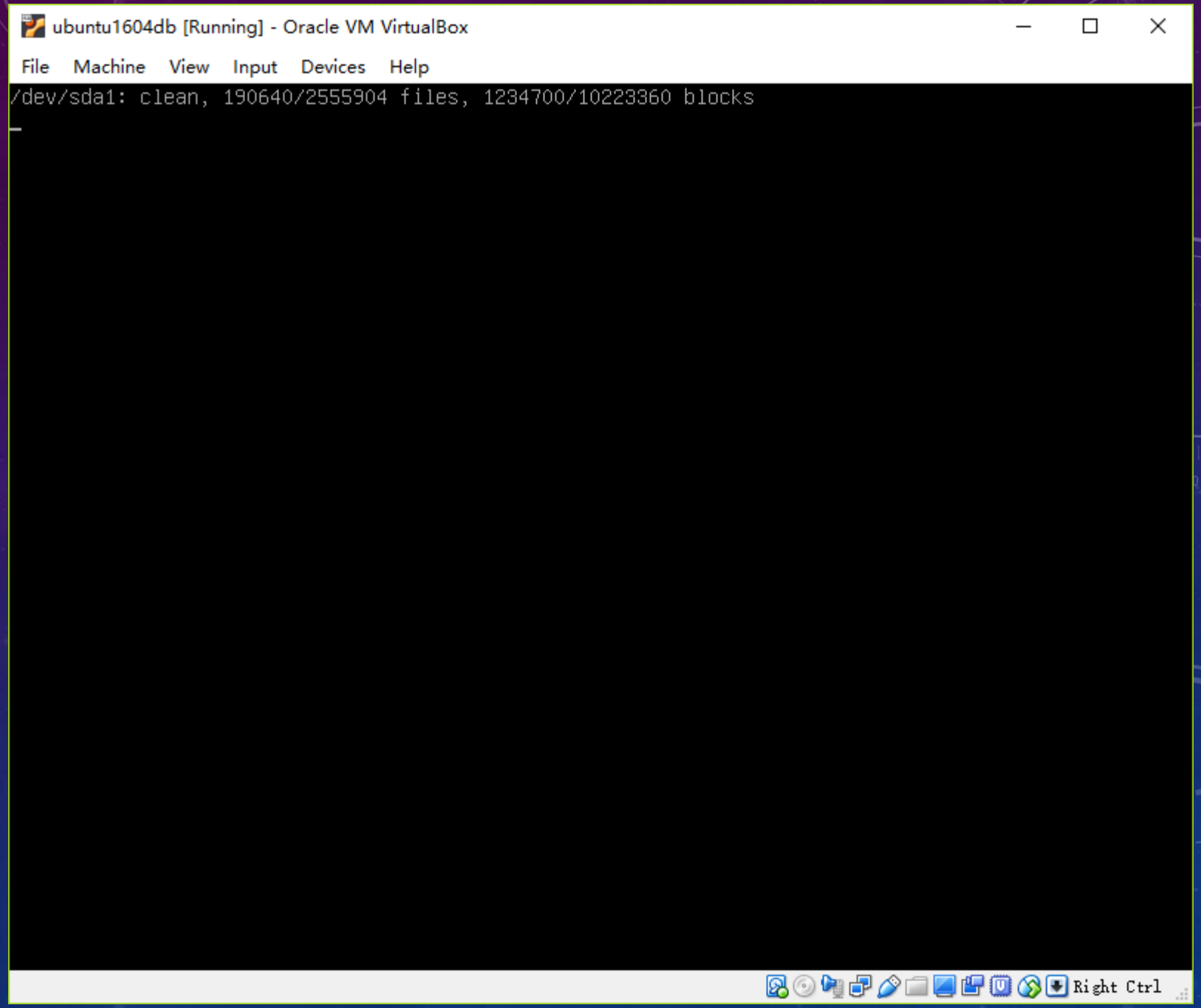
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Restart



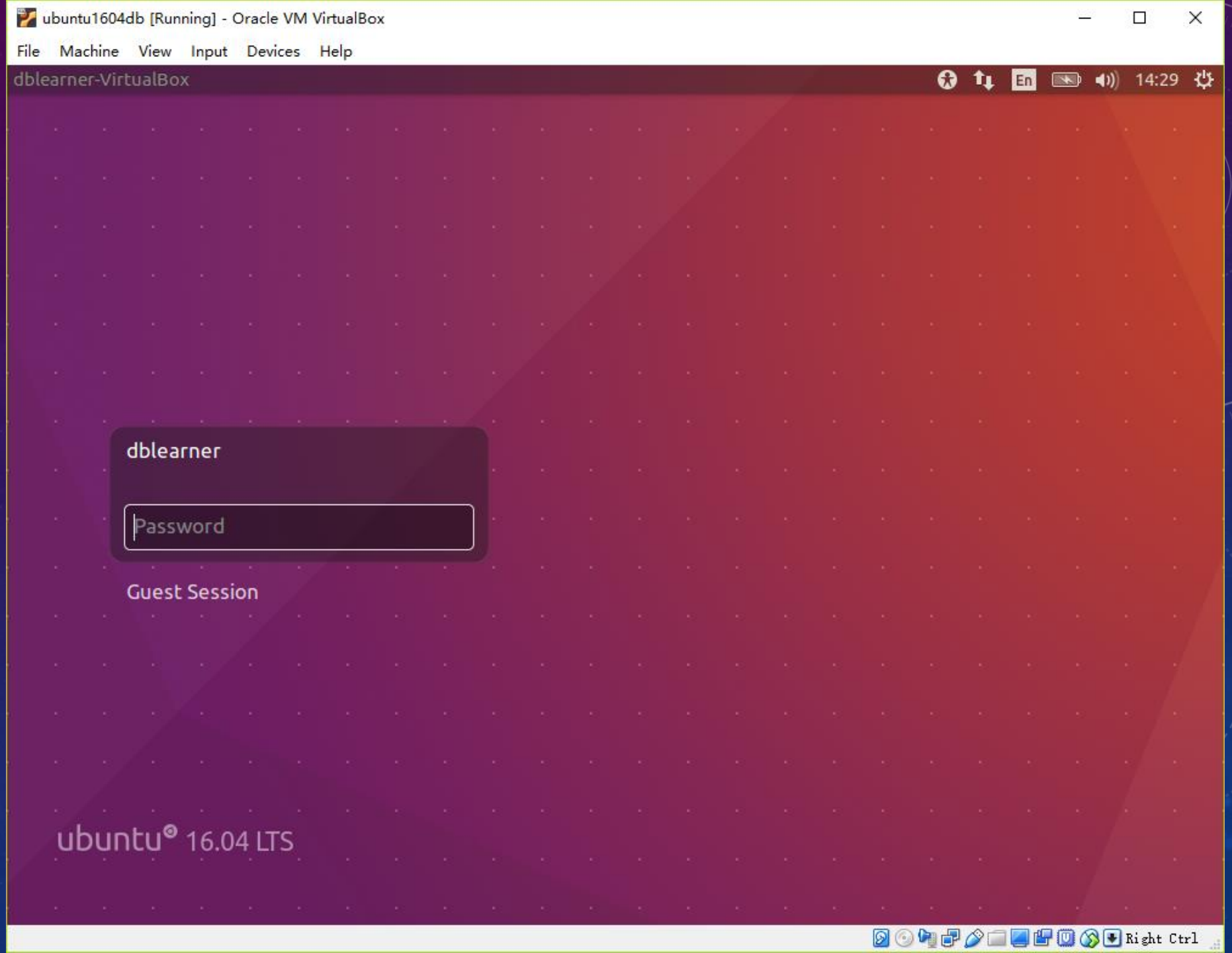
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Booting …



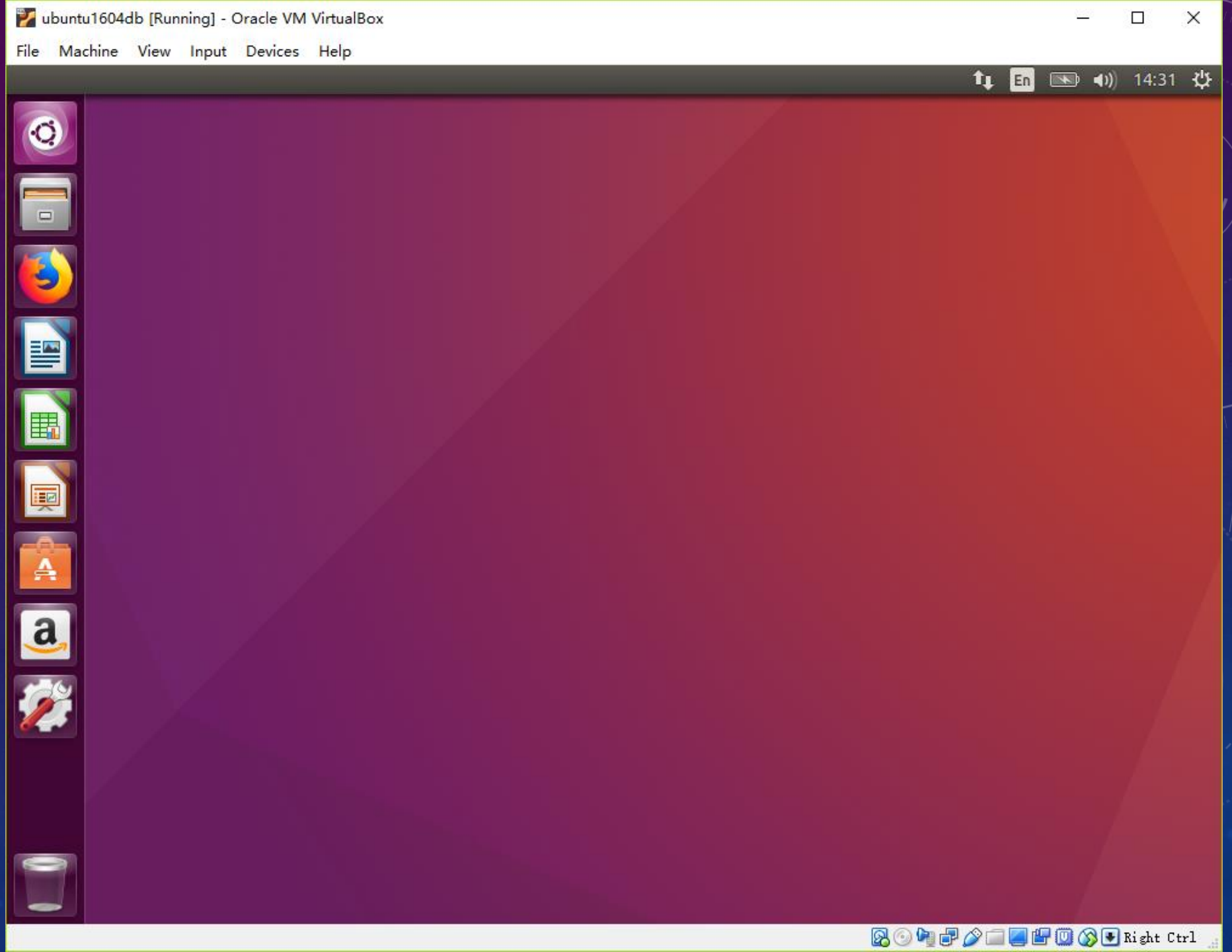
INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Input your pwd



INSTALL A GUEST UBUNTU OS IN VIRTUALBOX

- Gnome Desktop

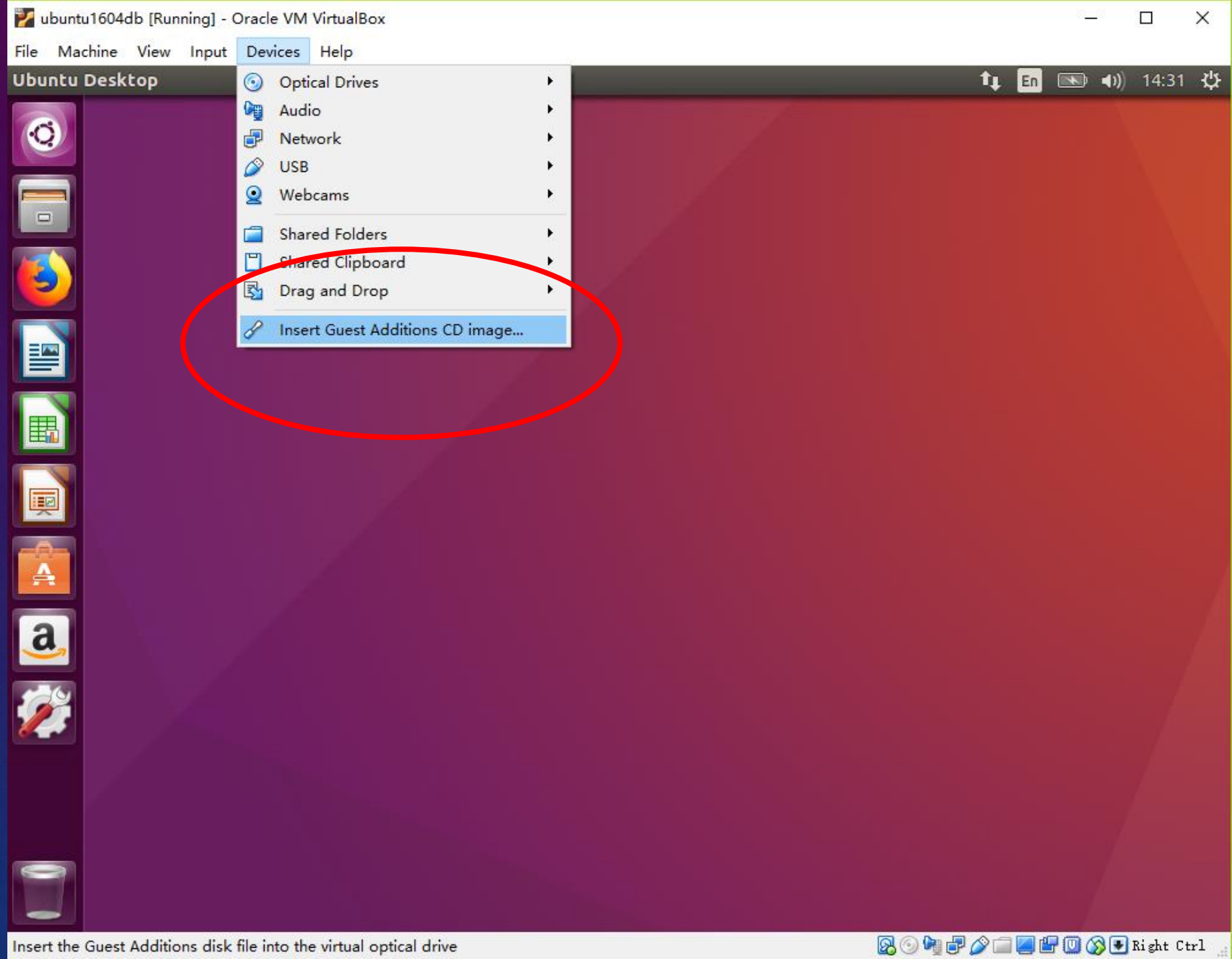


INSTALLING UBUNTU

- Installing Ubuntu
- Post-Installation Configuration

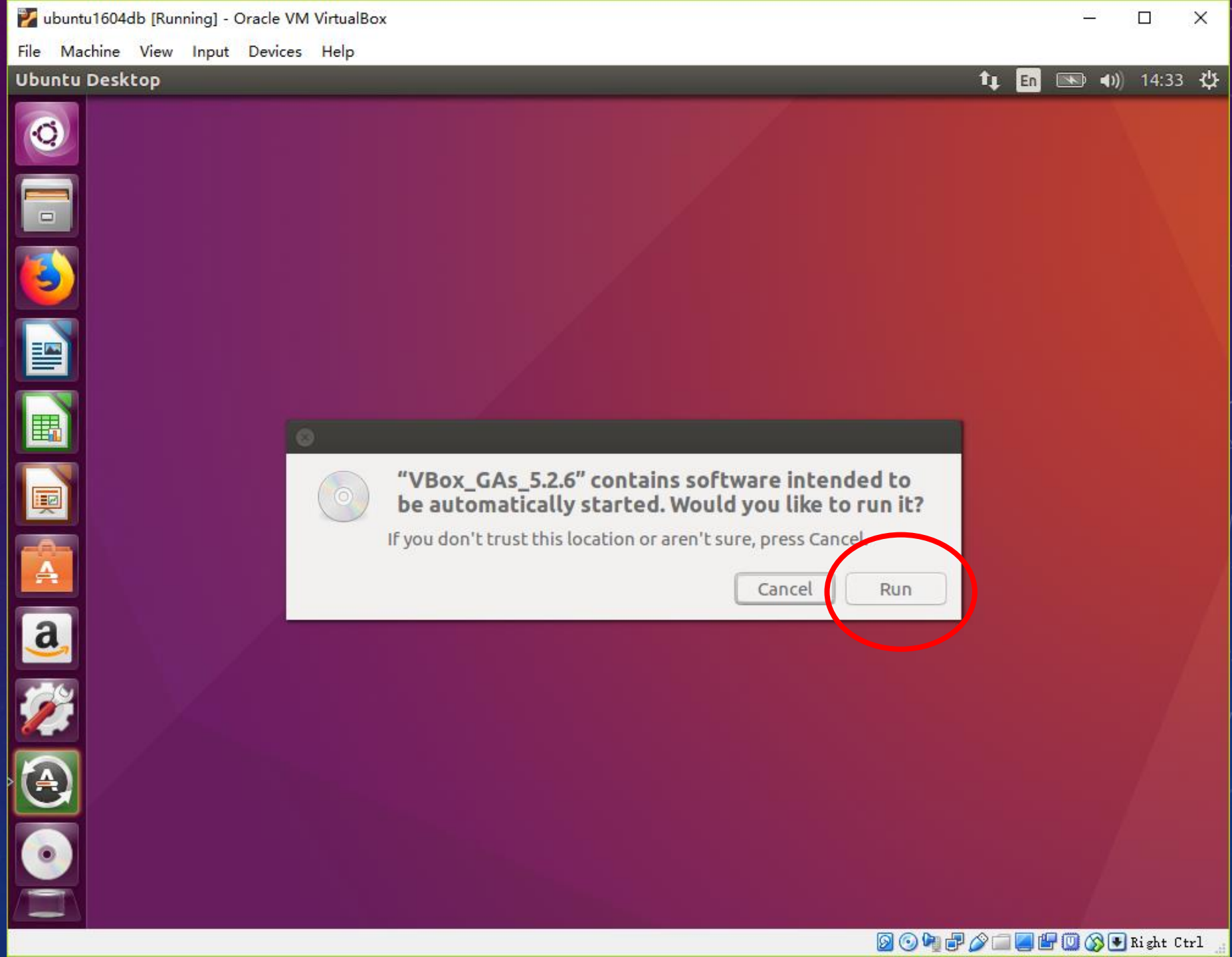
POST-INSTALLATION UBUNTU OS

- To enhance guest os



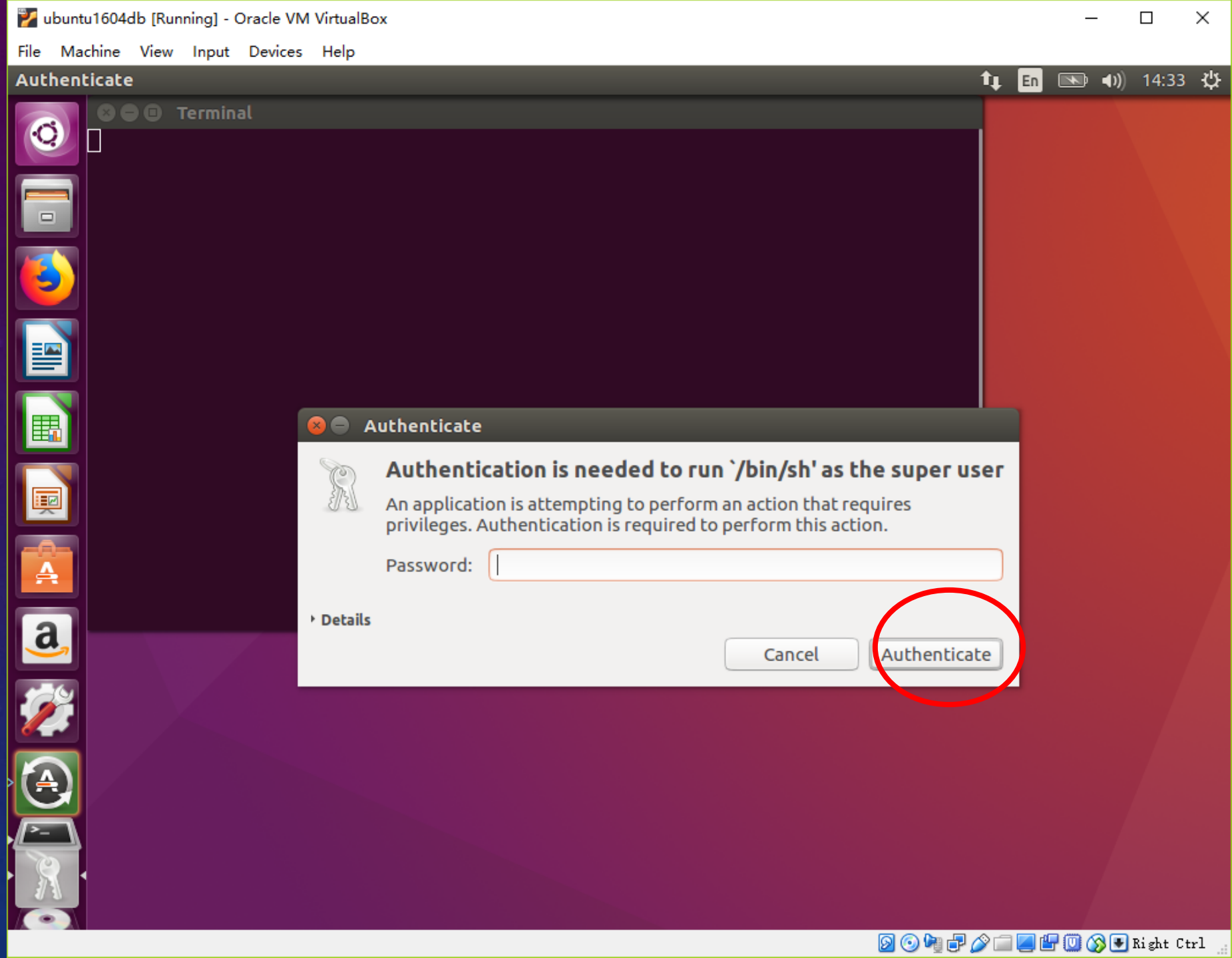
POST-INSTALLATION UBUNTU OS

- To enhance guest os



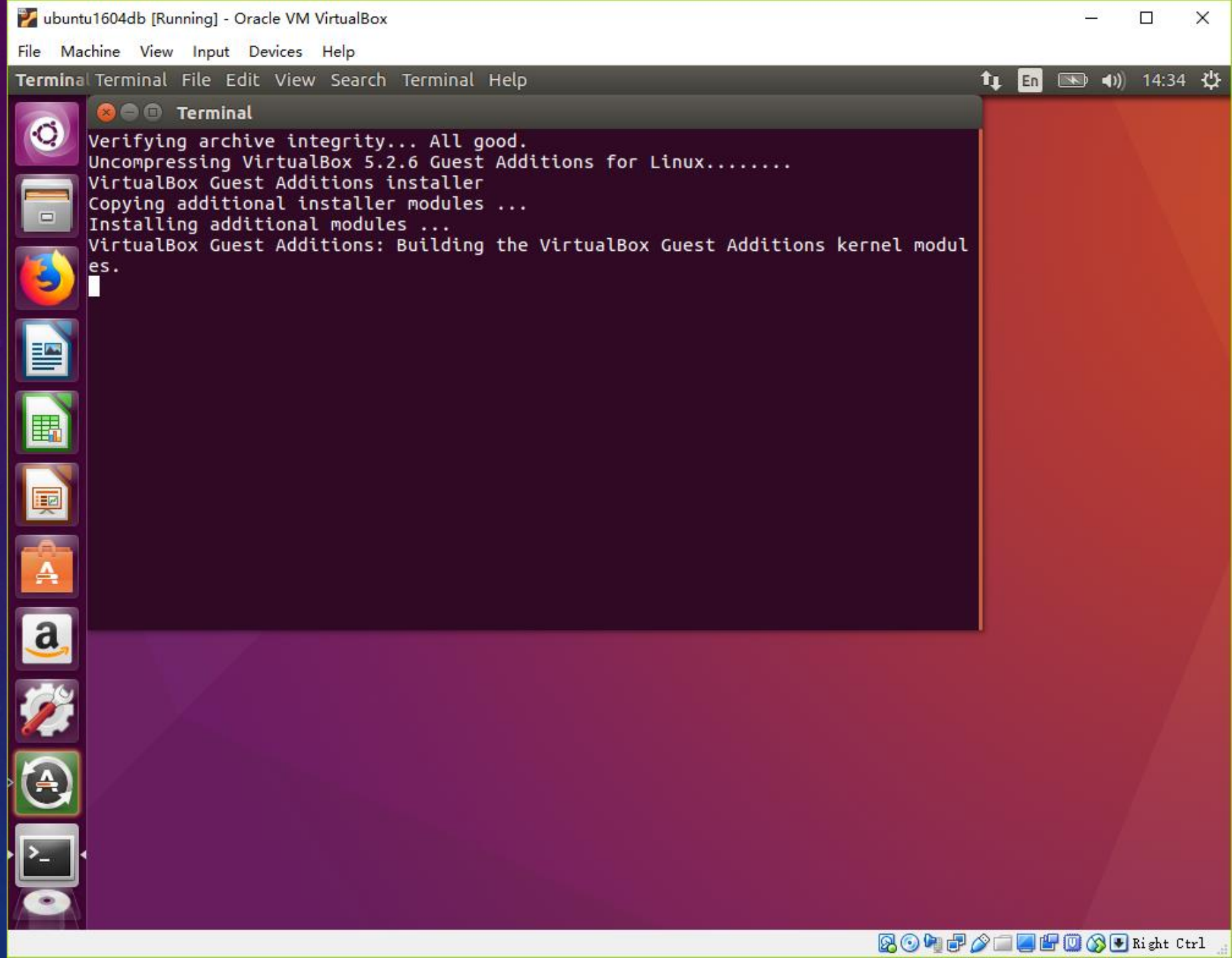
POST-INSTALLATION UBUNTU OS

- To enhance guest os



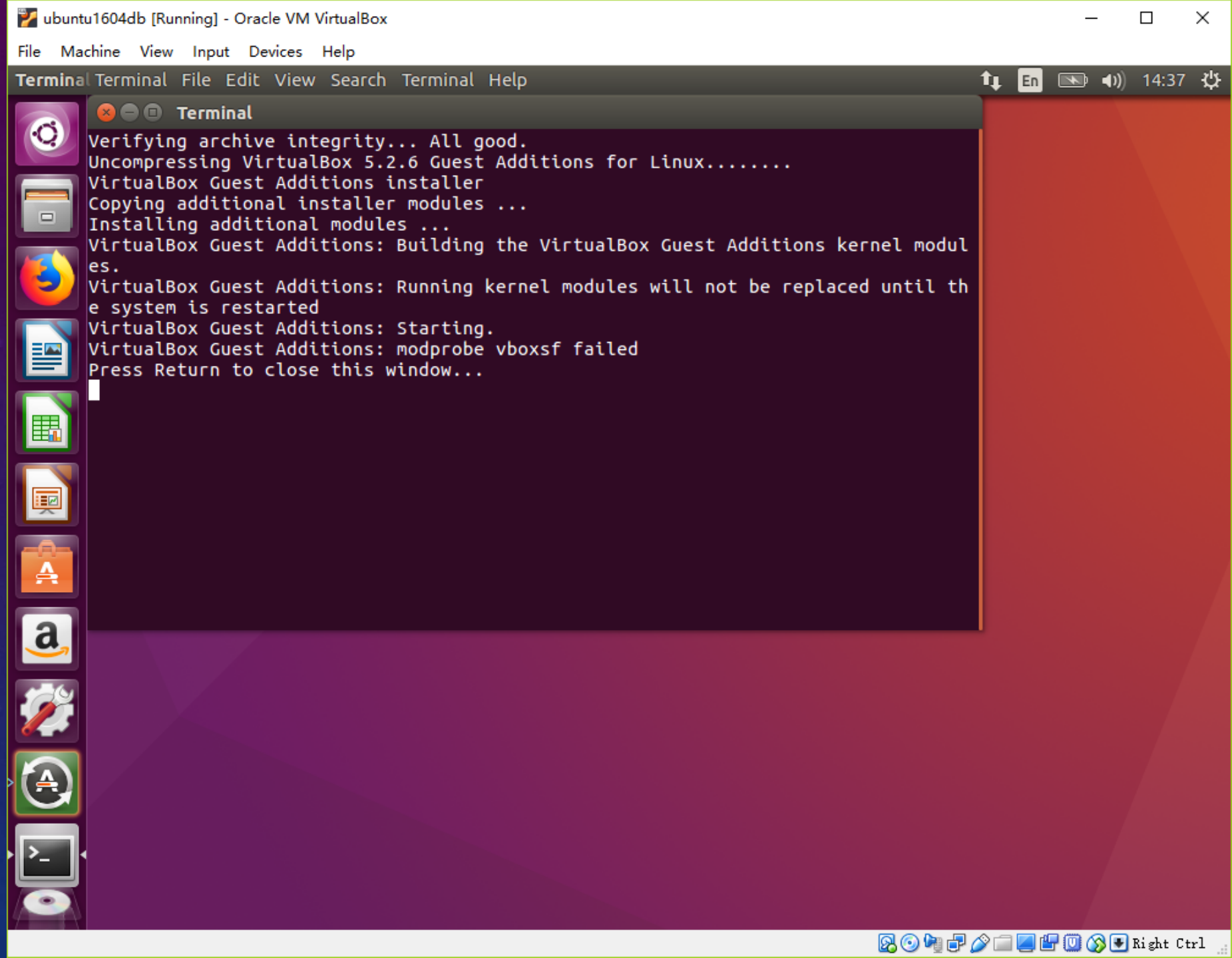
POST-INSTALLATION UBUNTU OS

- To enhance guest os



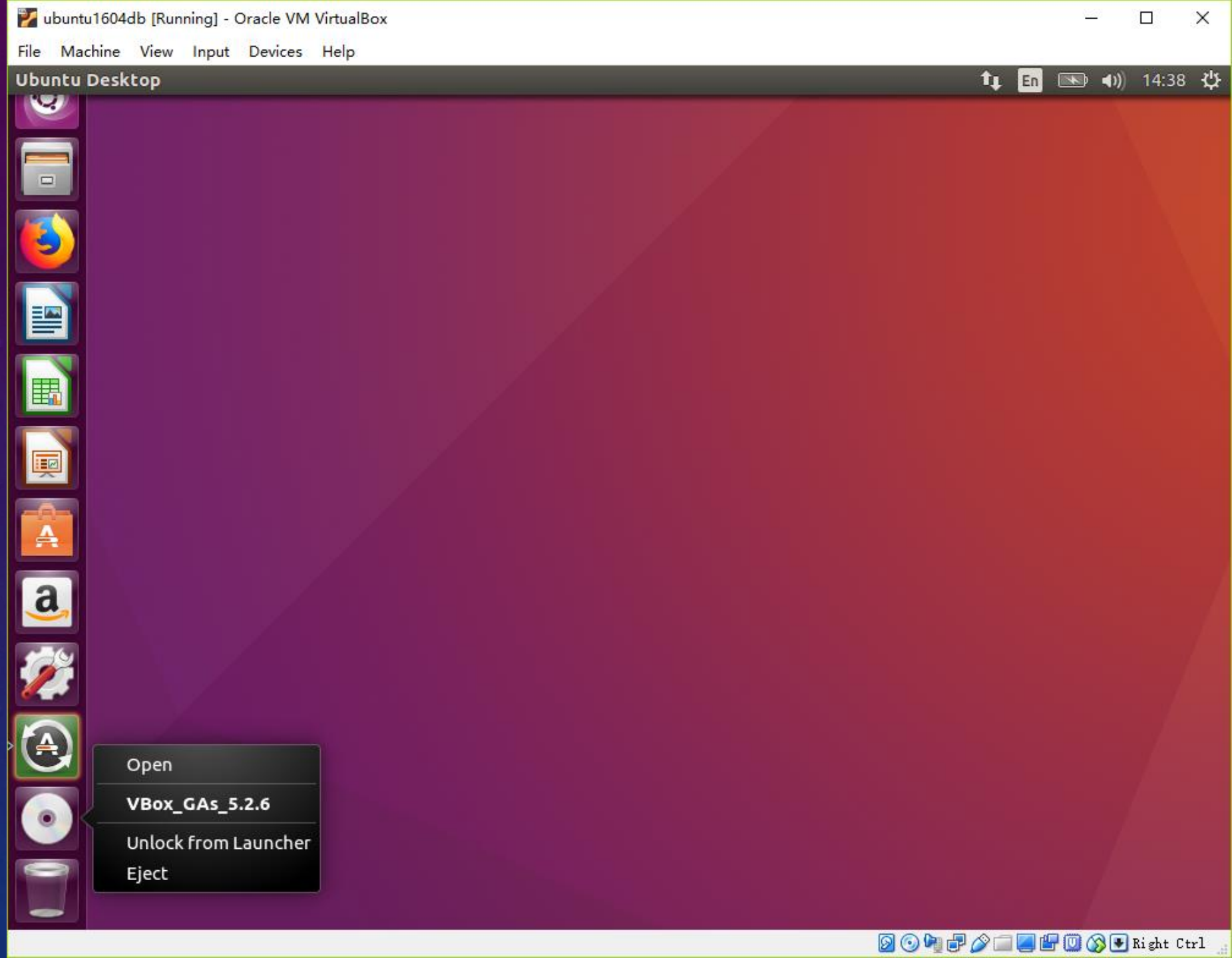
POST-INSTALLATION UBUNTU OS

- To enhance guest os



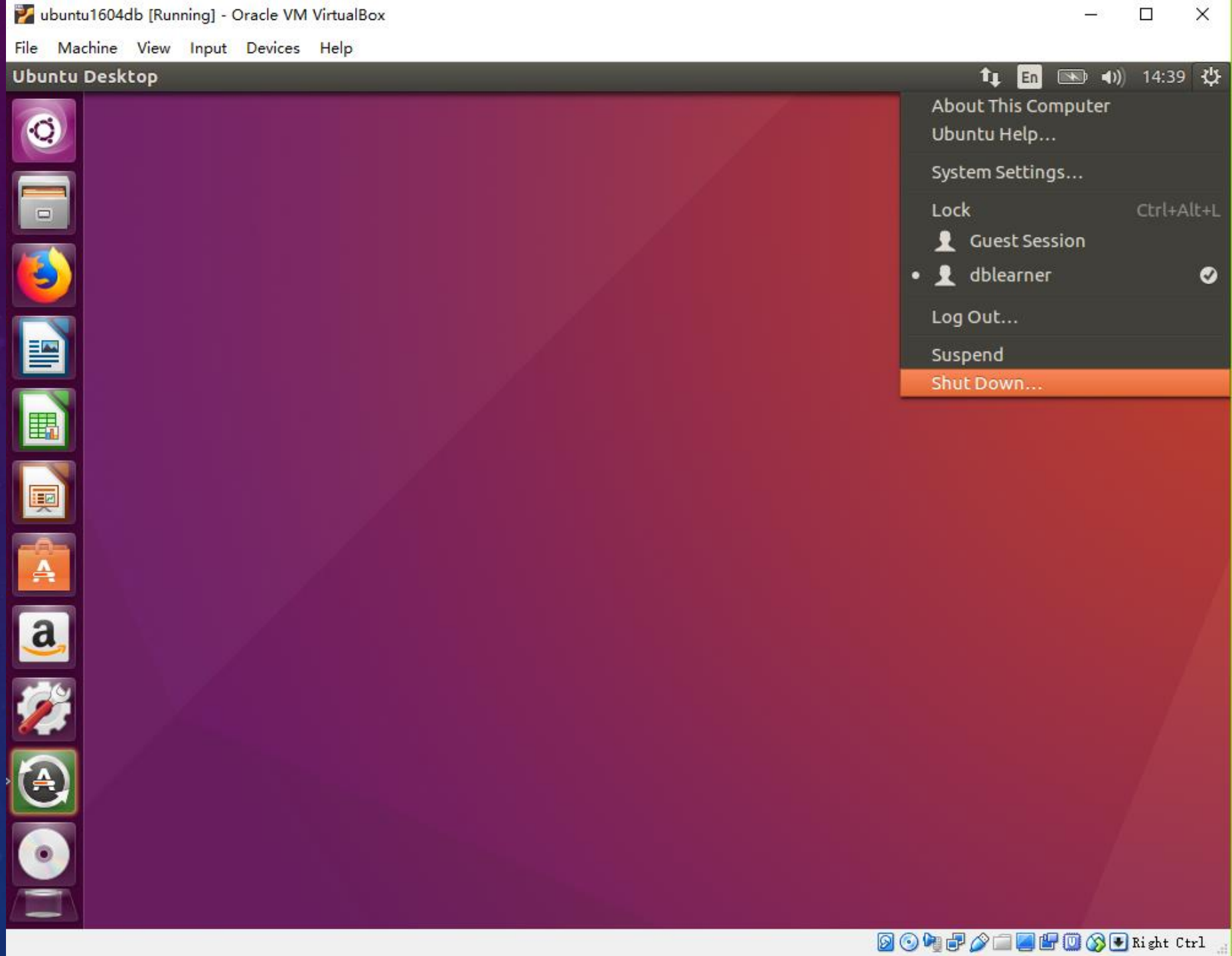
POST-INSTALLATION UBUNTU OS

- To enhance guest os
  - Eject



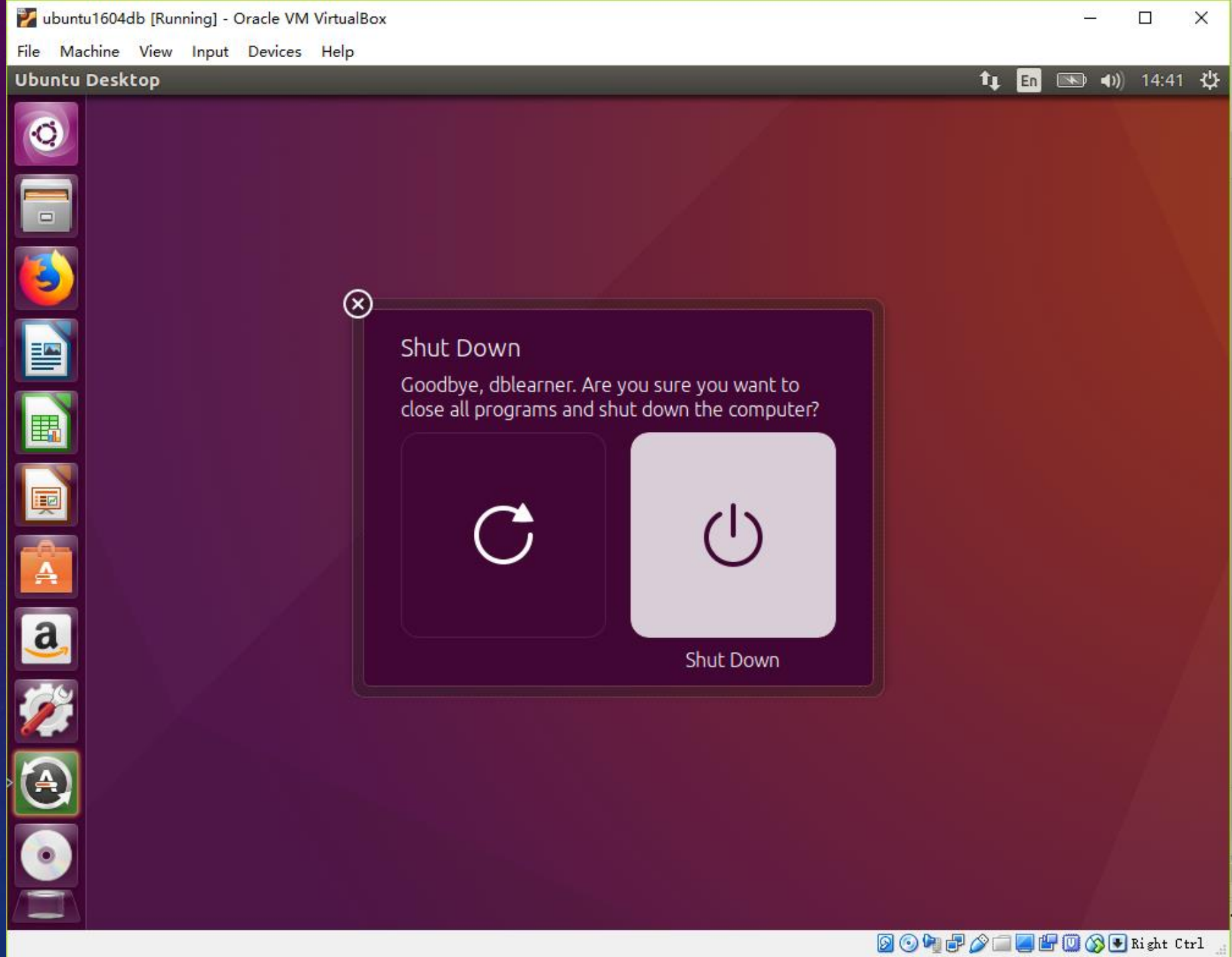
POST-INSTALLATION UBUNTU OS

- To enhance guest os
  - Restart



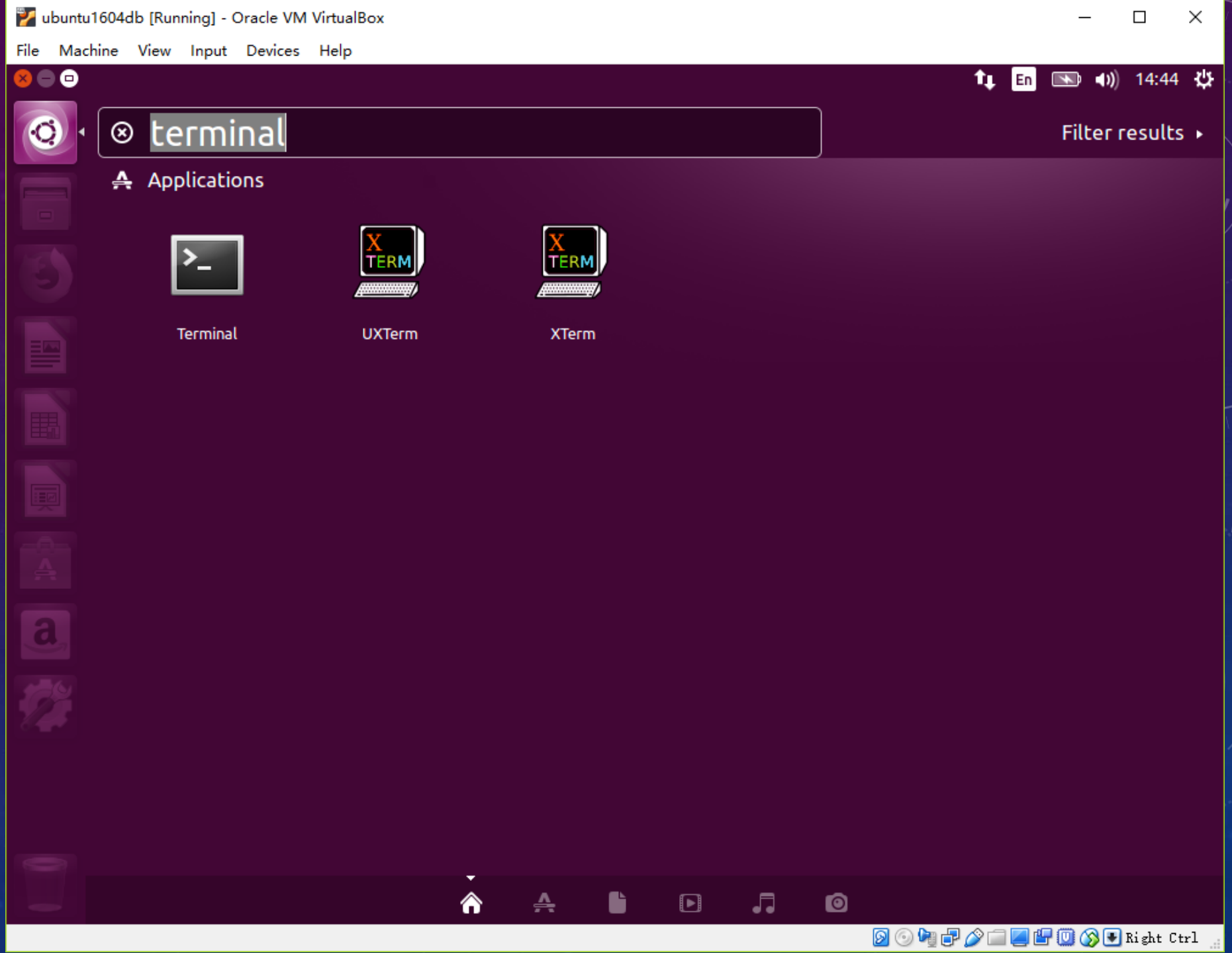
POST-INSTALLATION UBUNTU OS

- To enhance guest os
  - Eject and Restart



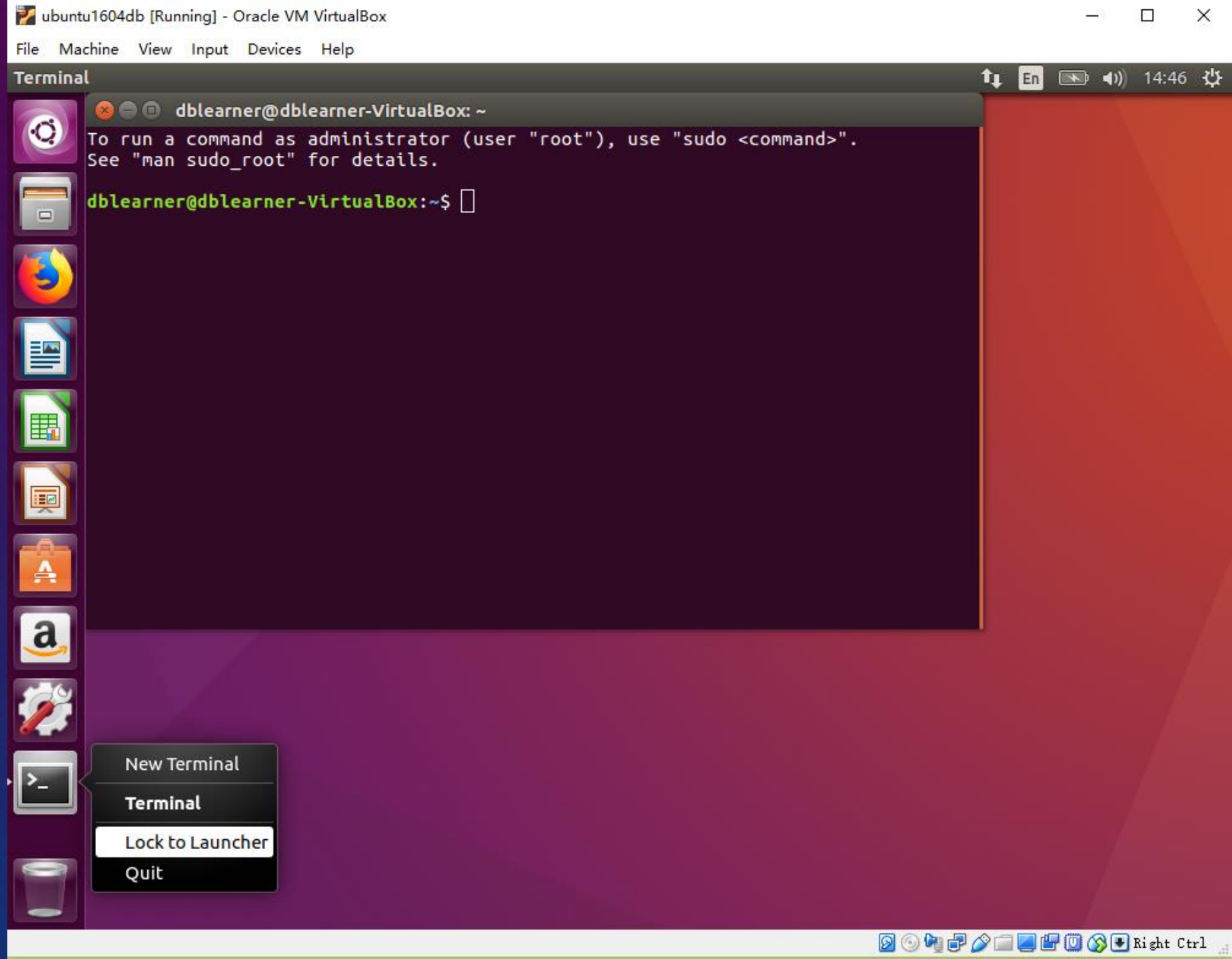
POST-INSTALLATION UBUNTU OS

- Dashboard
  - terminal



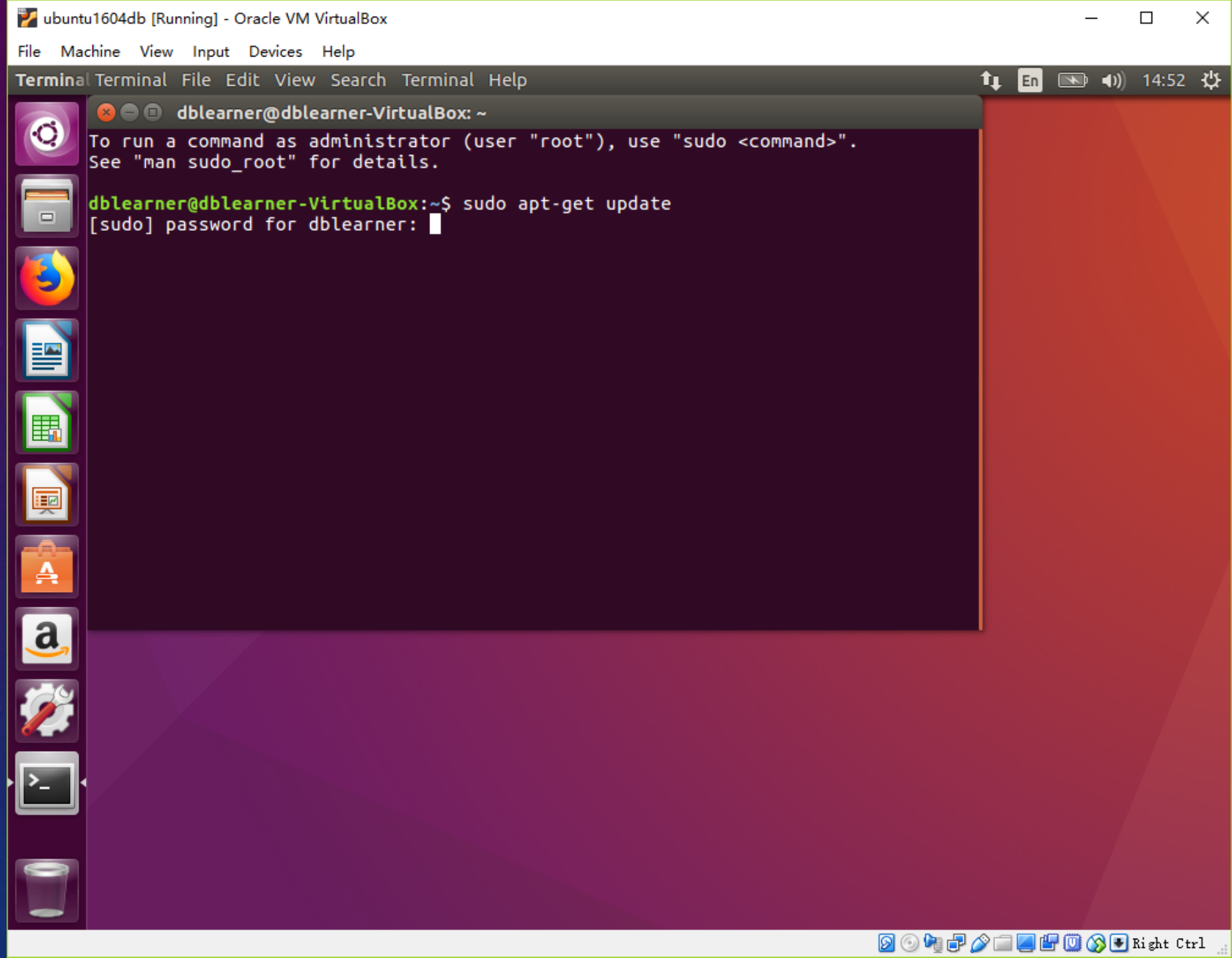
POST-INSTALLATION UBUNTU OS

- Dashboard
  - Terminal
    - Lock to launcher



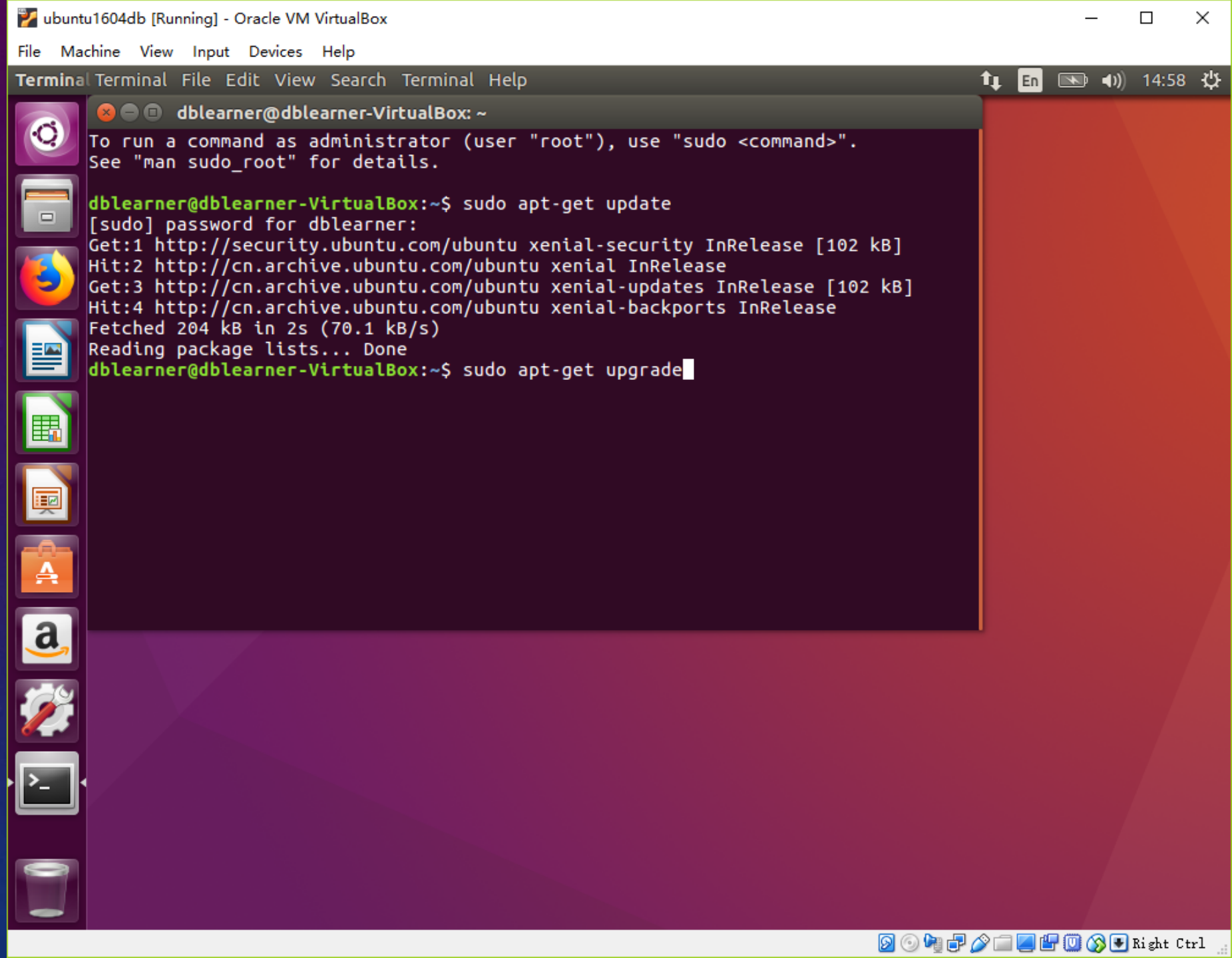
POST-INSTALLATION UBUNTU OS

- Dashboard
  - Update OS



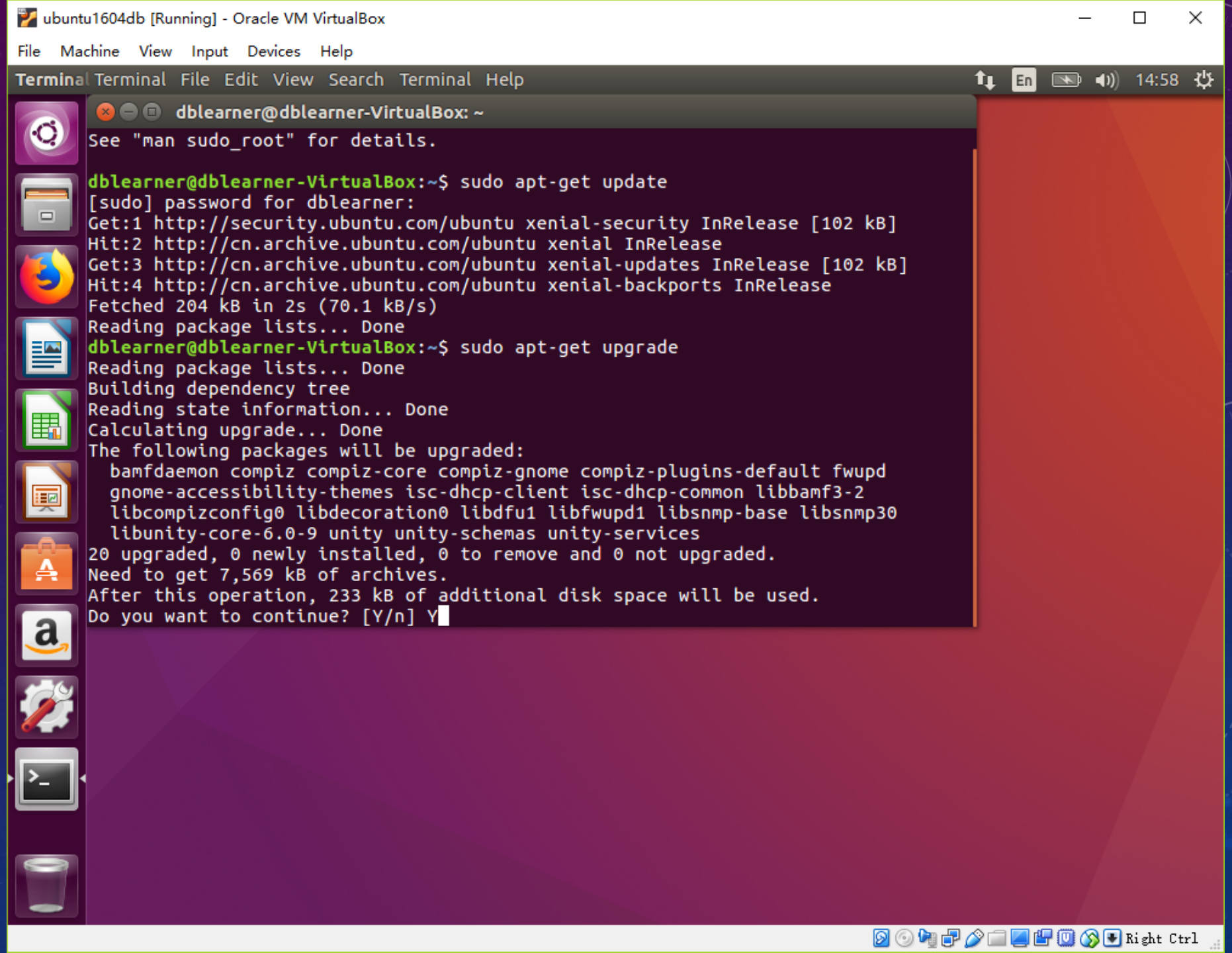
POST-INSTALLATION UBUNTU OS

- Dashboard
  - Update OS



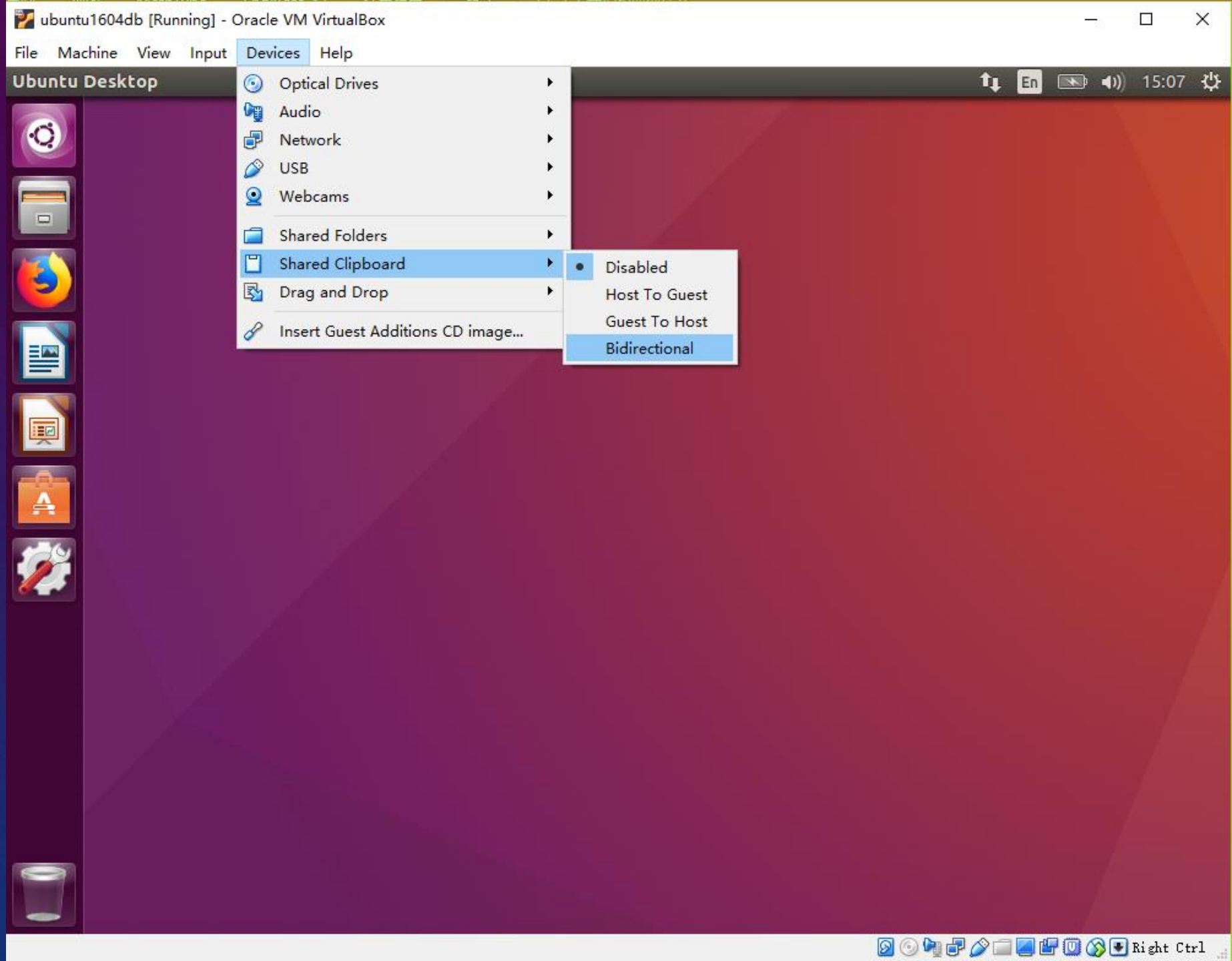
POST-INSTALLATION UBUNTU OS

- Dashboard
  - Update OS



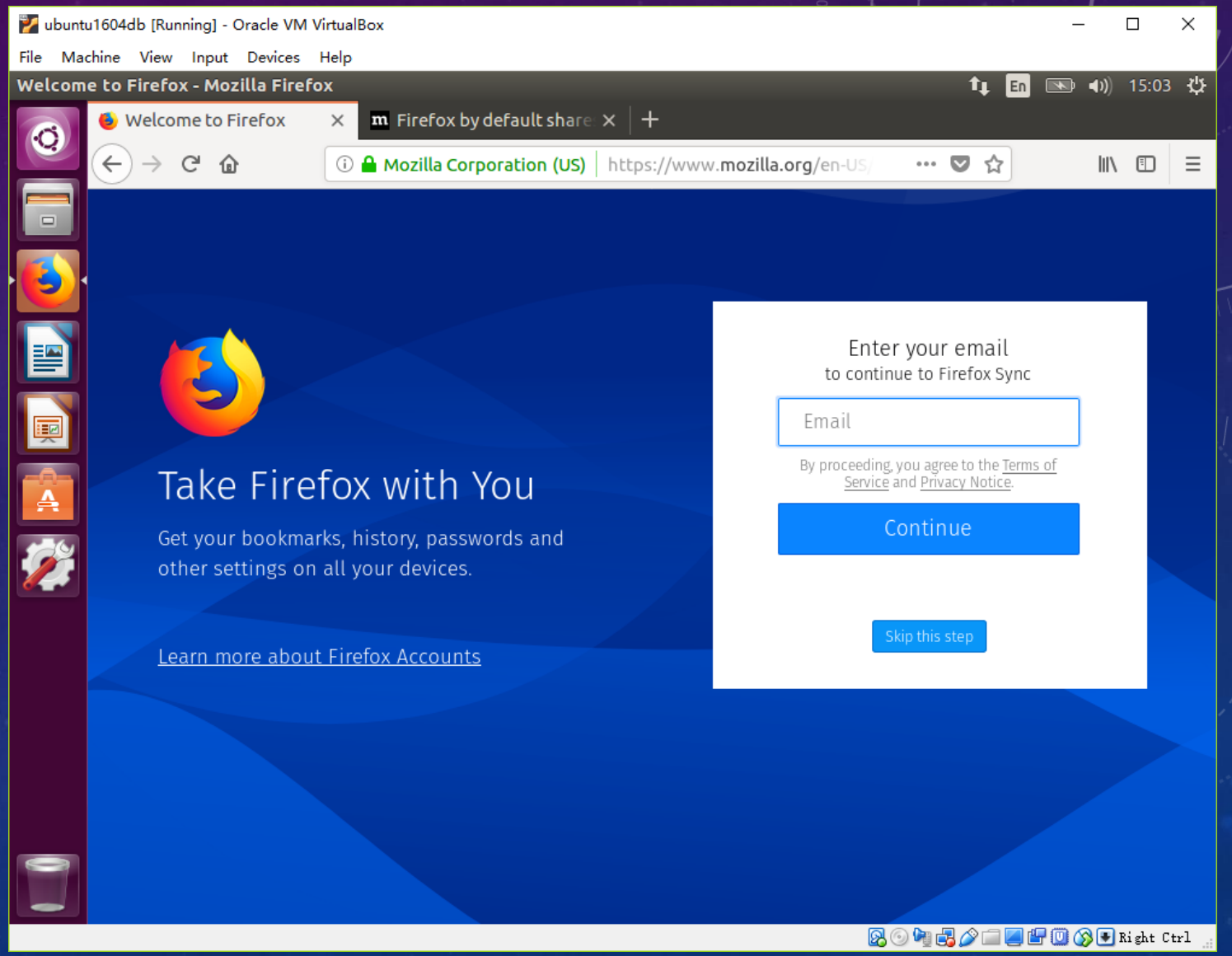
POST-INSTALLATION UBUNTU OS

- Shared between host os and guest os



WORKING WITH UBUNTU

- On the Internet
- Productivity Applications
- Multimedia Applications
- System Administration
- …



DATABASES

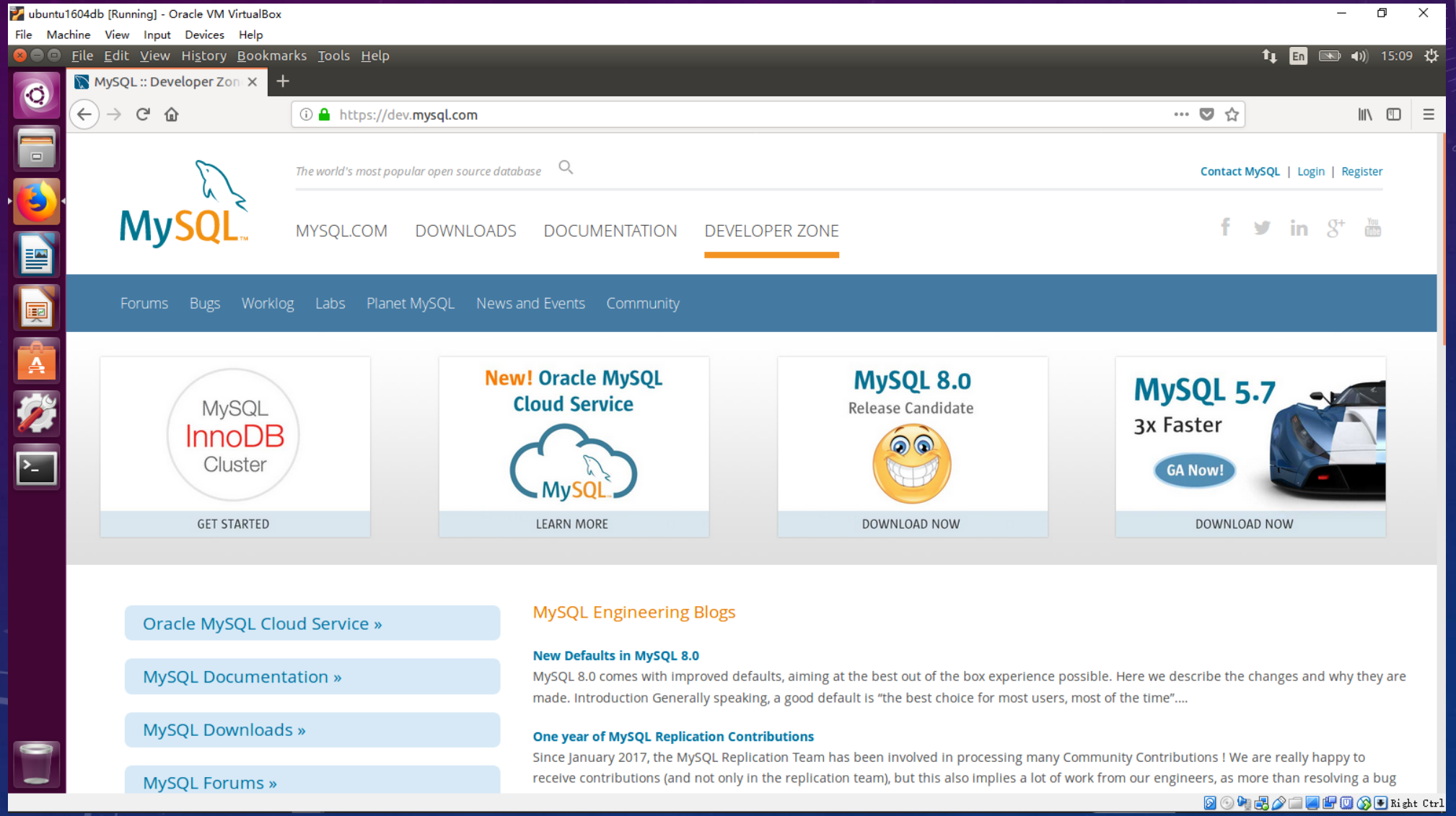
- MySQL
- PostgreSQL
- MongoDB
- …

DBA’S RESPONSIBILITIES

- Installing and maintaining database servers
- Installing and maintaining database clients
- Managing accounts and users
- Ensuring database security
- Ensuring data integrity

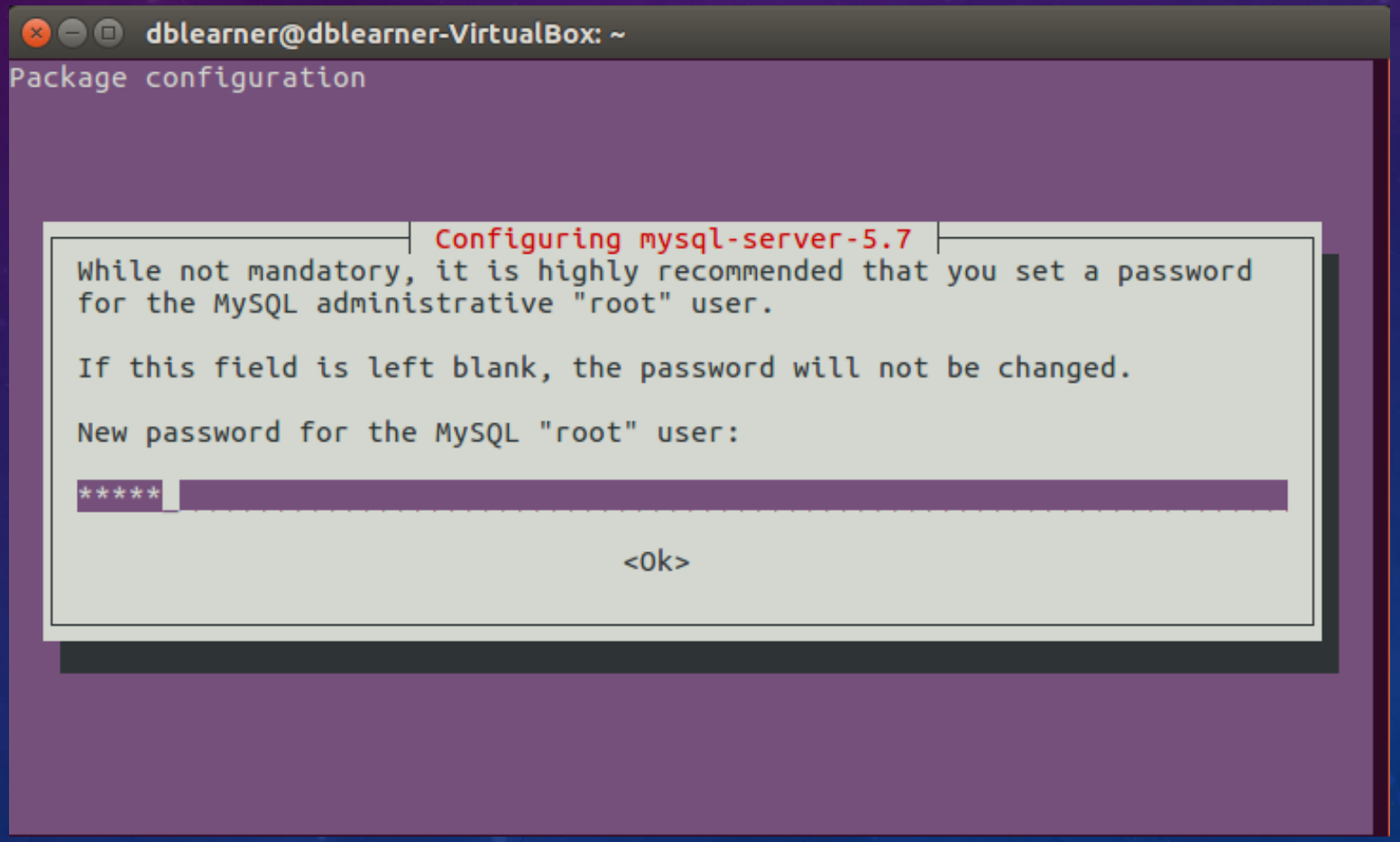
MYSQL

- https://dev.mysql.com/



MYSQL: INSTALLATION

- sudo apt-get install mysql-server



MYSQL: INSTALLATION

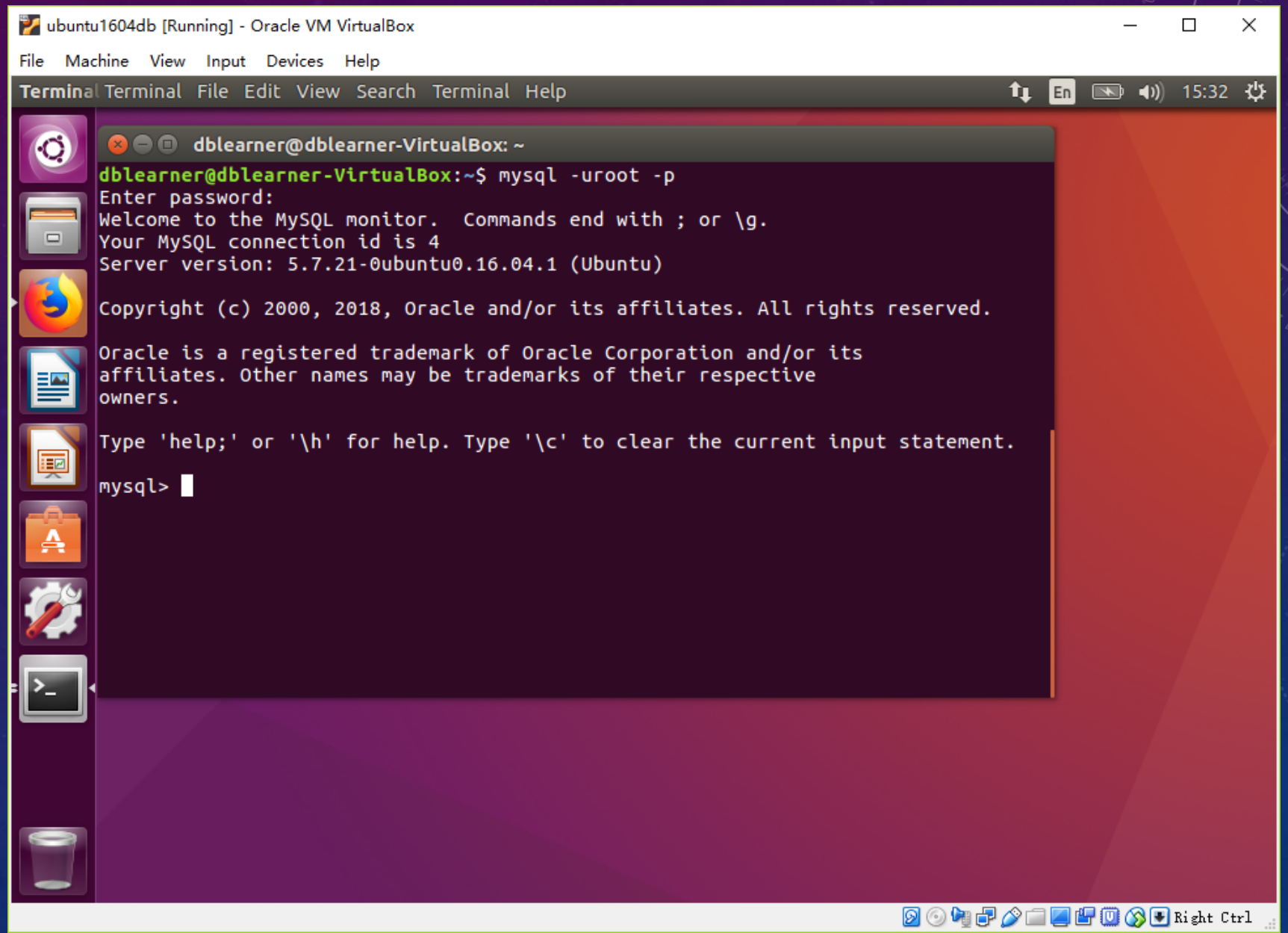
- sudo apt install mysql-client
- sudo apt install libmysqlclient-dev

- Test db
- sudo netstat -tap | grep mysql

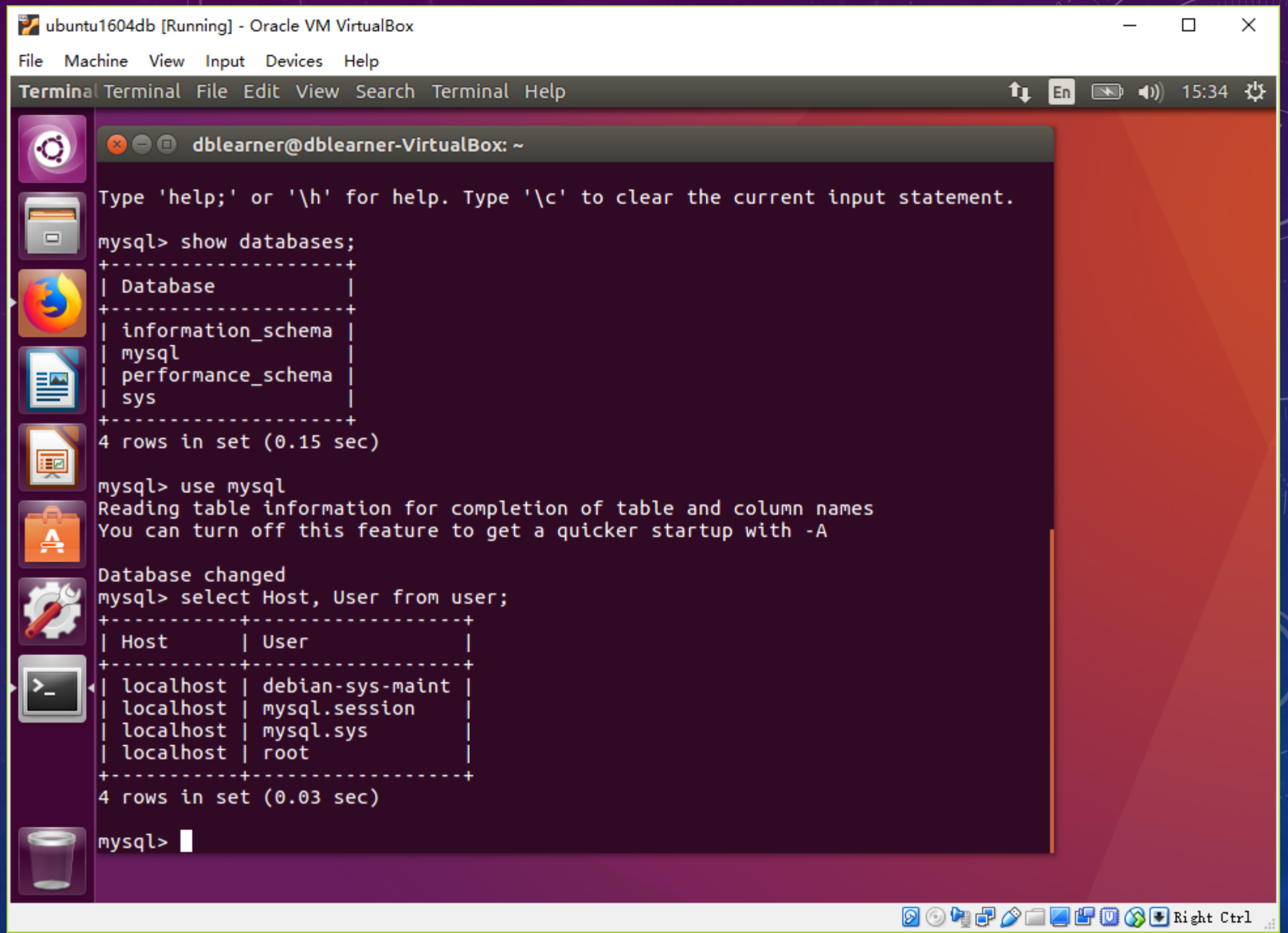
```
dblearner@dblearner-VirtualBox:~$ sudo netstat -tap | grep mysql
tcp        0      0 localhost:mysql         *:*                     LISTEN
7364/mysqld
dblearner@dblearner-VirtualBox:~$
```

MYSQL: ACCESS

- mysql -uroot -p



MYSQL: ACCESS

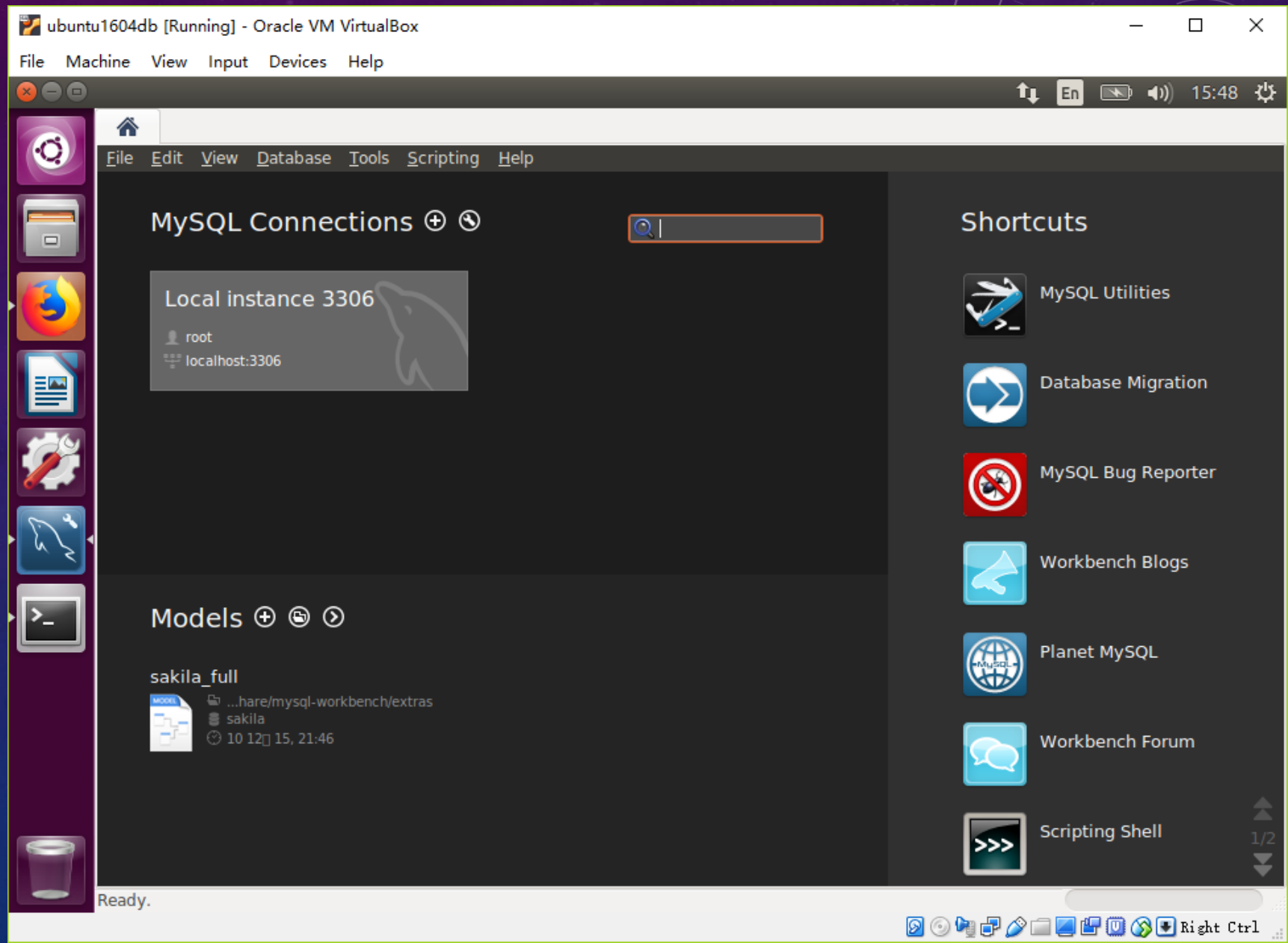


MYSQL: SERVICE MANAGEMENT

- sudo systemctl stop mysql.service
- sudo systemctl start mysql.service
- sudo systemctl restart mysql.service
- sudo systemctl status mysql.service

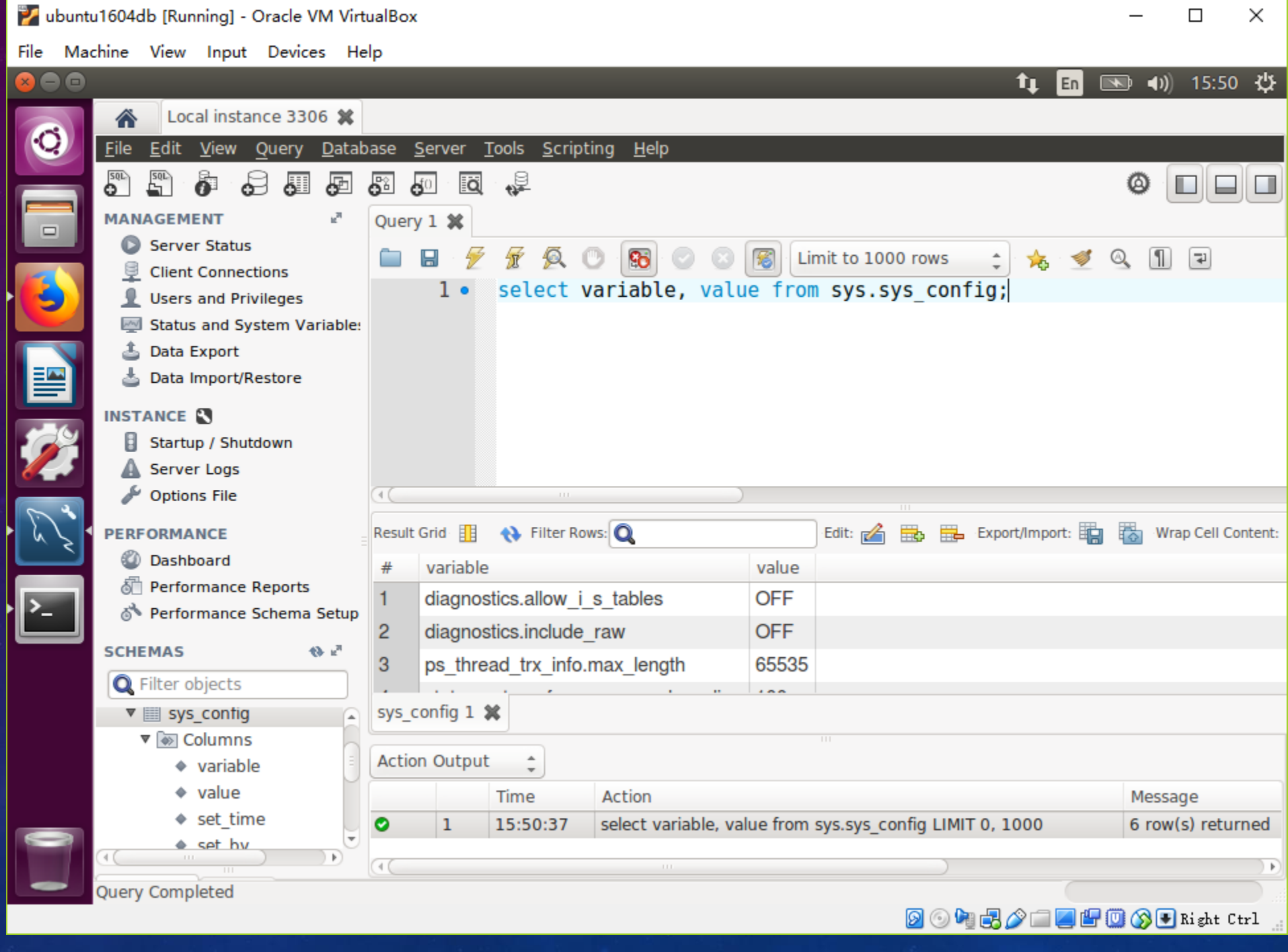
MYSQL: GUI CLIENT APPLICATION

- mysql-workbench
  - sudo apt-get install mysql-workbench



MYSQL:

mysql-workbench



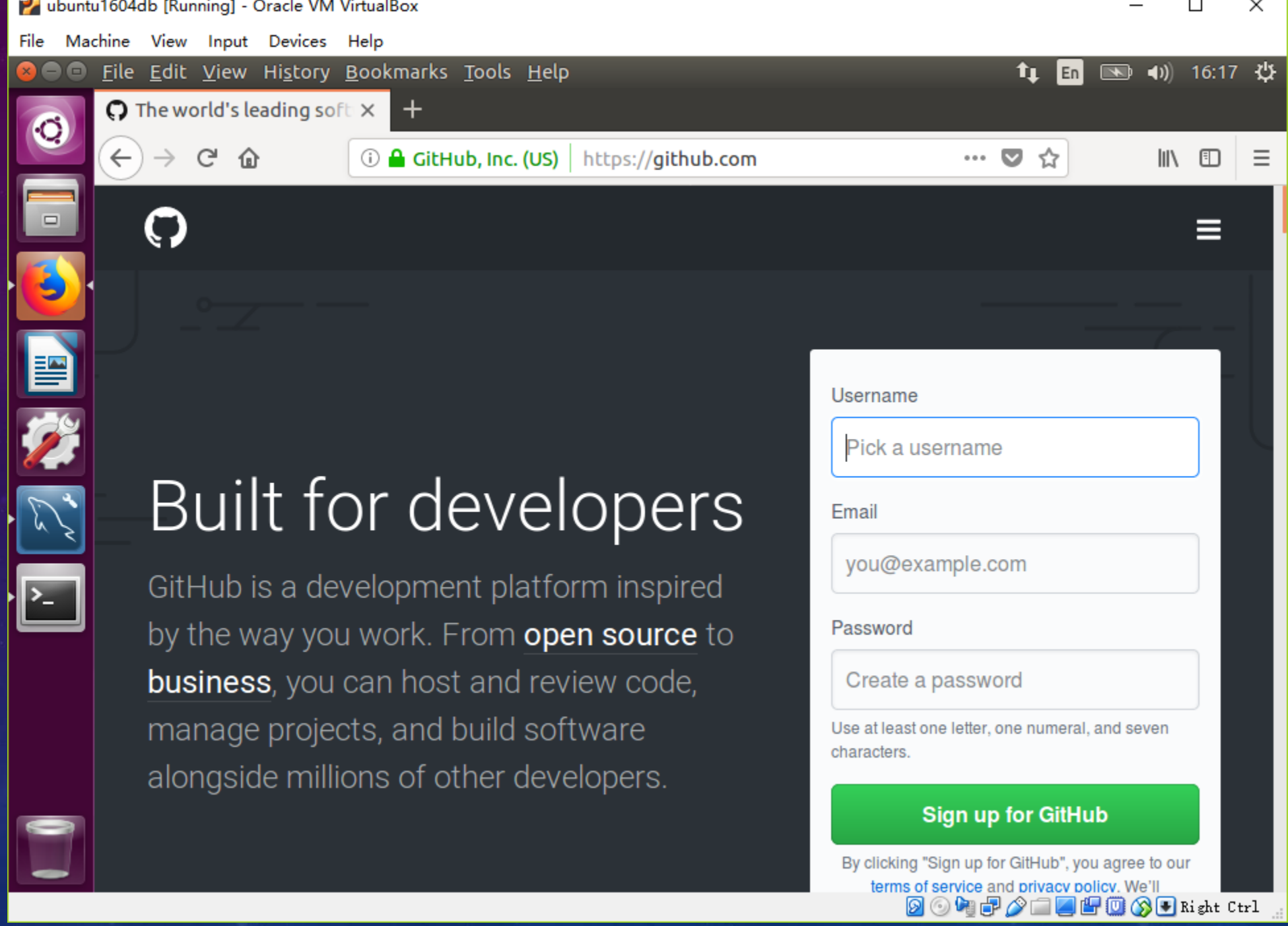
MYSQL: IMPORT DATA OF LABS

- Import the data of Database system concepts
- How to store the data, and anyone can access it easily?

MYSQL: IMPORT DATA OF LABS

- Github

https://github.com

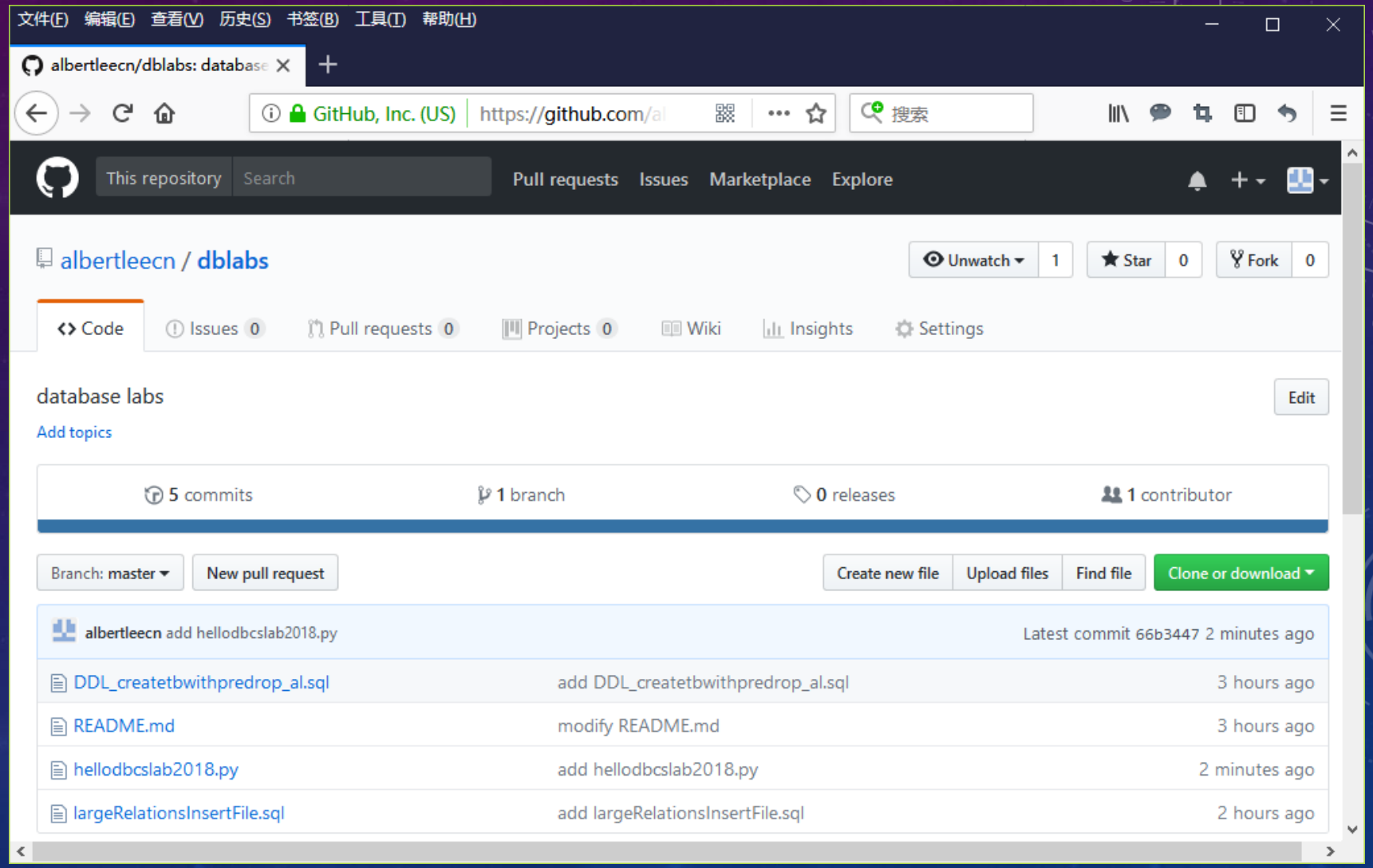


GIT

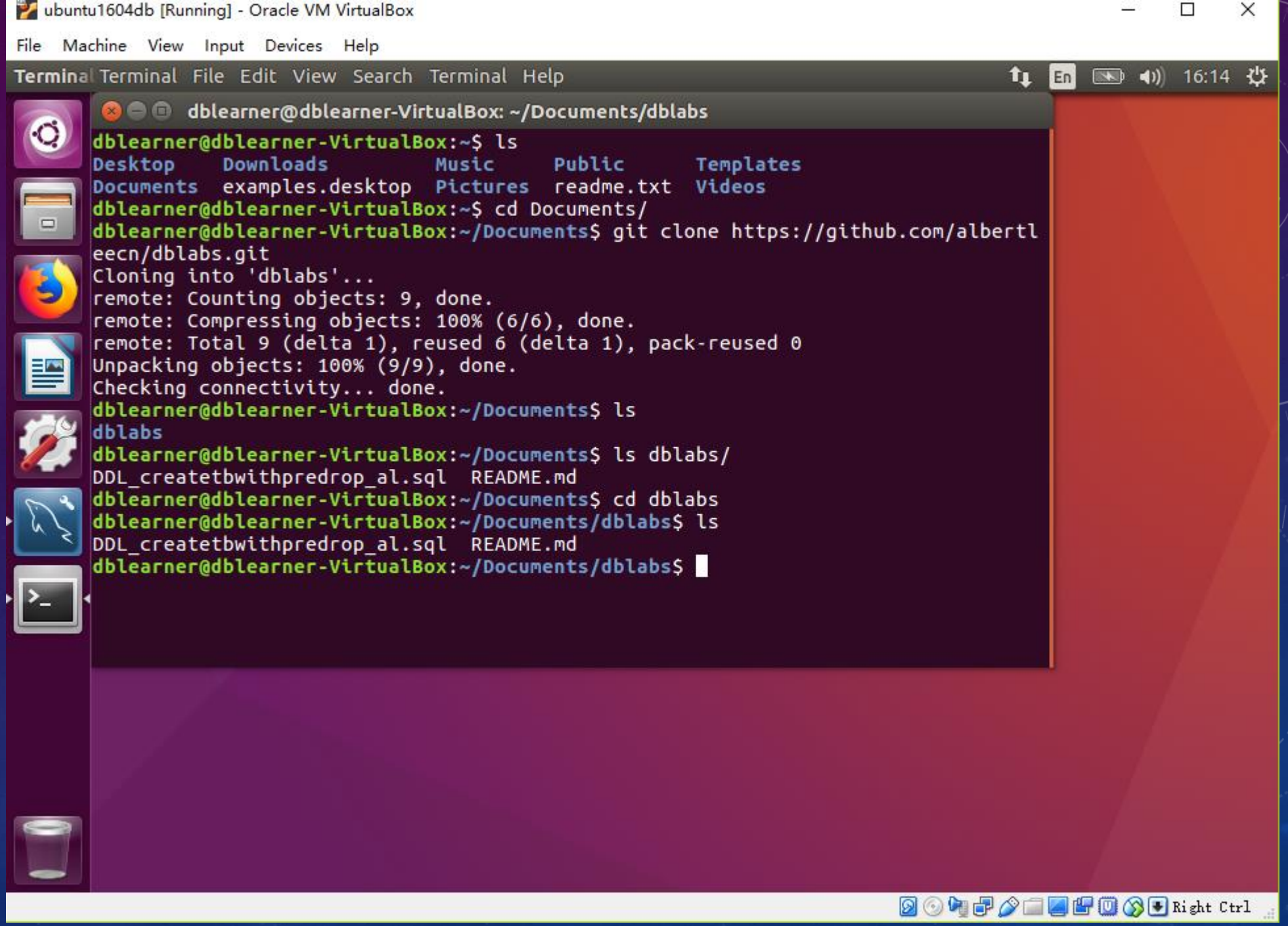
- Git is a version control system for tracking changes in computer files and coordinating work on those files among multiple people. It is primarily used for source code management in software development, but it can be used to keep track of changes in any set of files.
- As a distributed revision control system it is aimed at speed, data integrity, and support for distributed, non-linear workflows.
- Git was created by Linus Torvalds in 2005 for development of the Linux kernel, with other kernel developers contributing to its initial development.

MYSQL: IMPORT DATA OF LABS

git clone https://github.com/albertleecn/dblabs.git

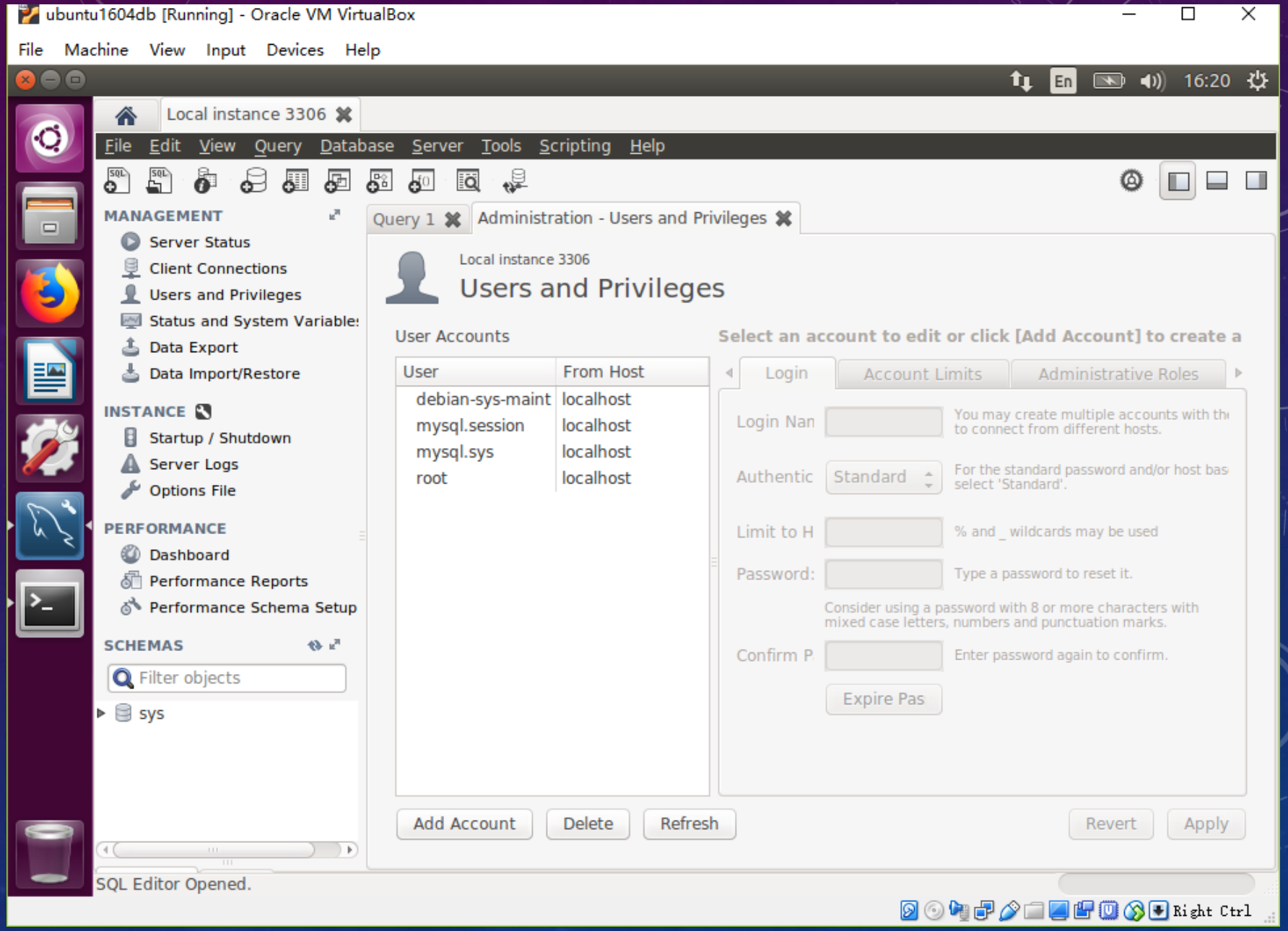


MYSQL: IMPORT DATA OF LABS



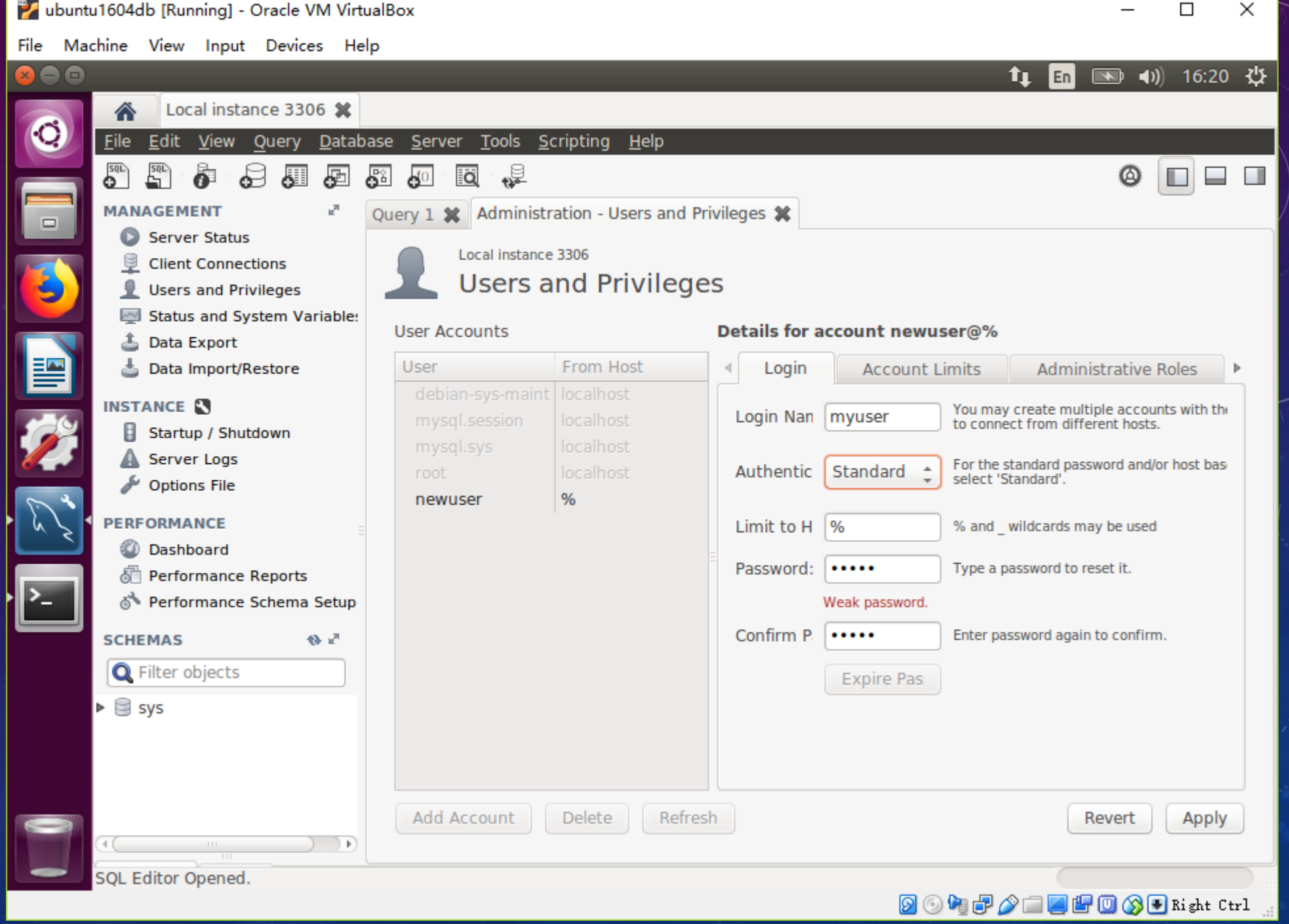
MYSQL: IMPORT DATA OF LABS

- Add DB User
  - myuser
    - mypwd



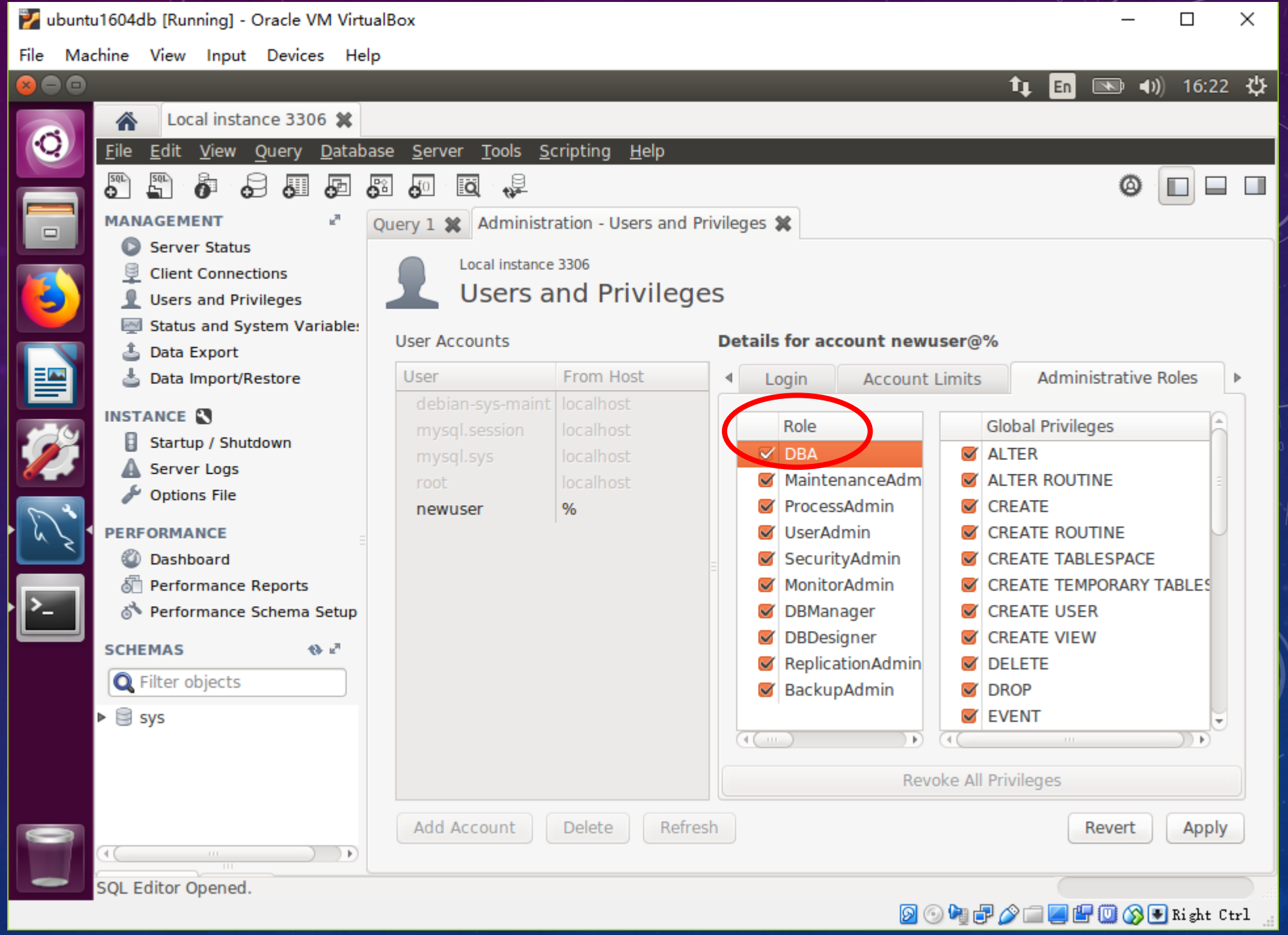
MYSQL: IMPORT DATA OF LABS

- Add DB User
  - myuser
    - mypwd



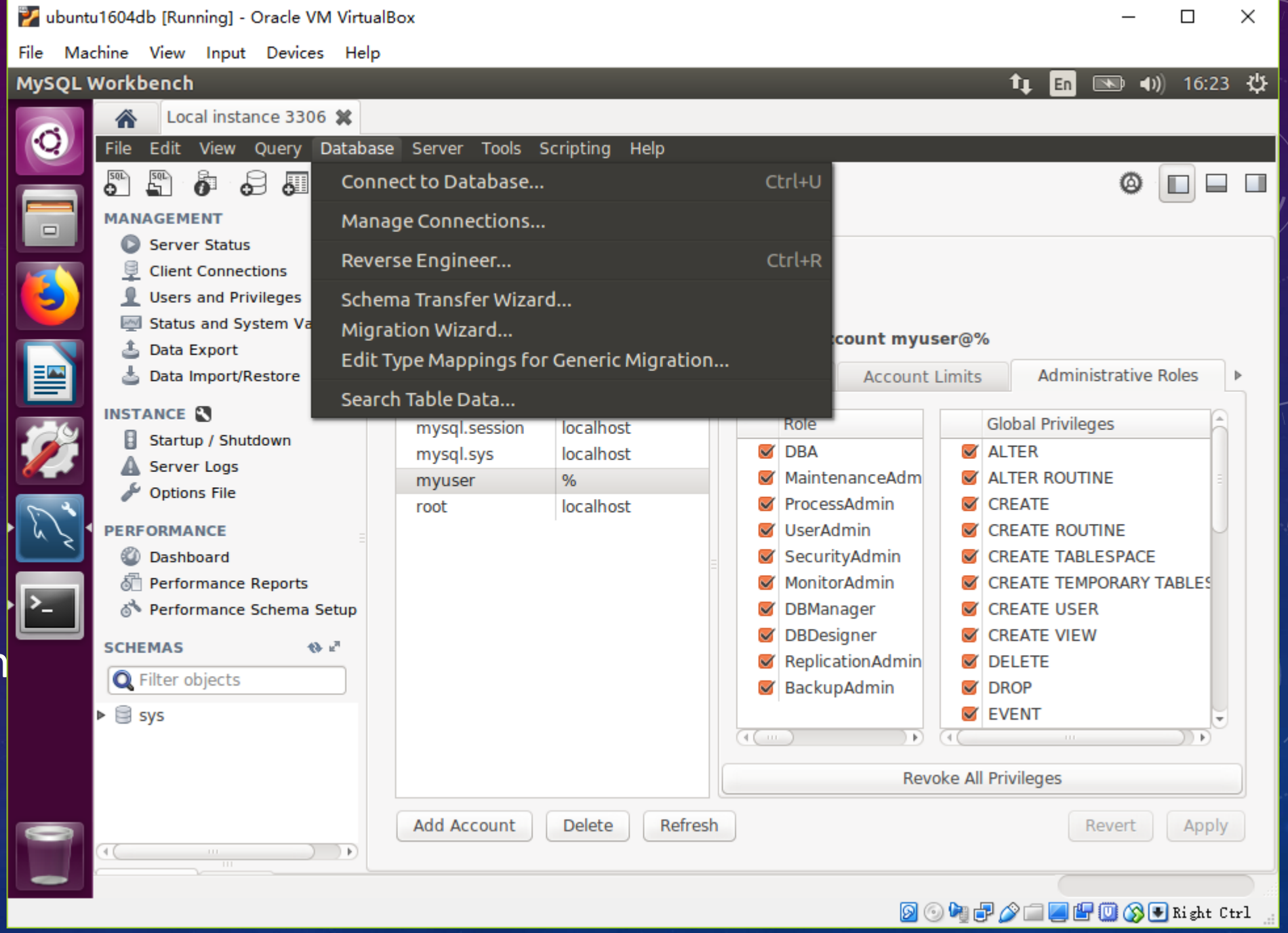
MYSQL: IMPORT DATA OF LABS

- Add DB User
  - myuser
    - mypwd



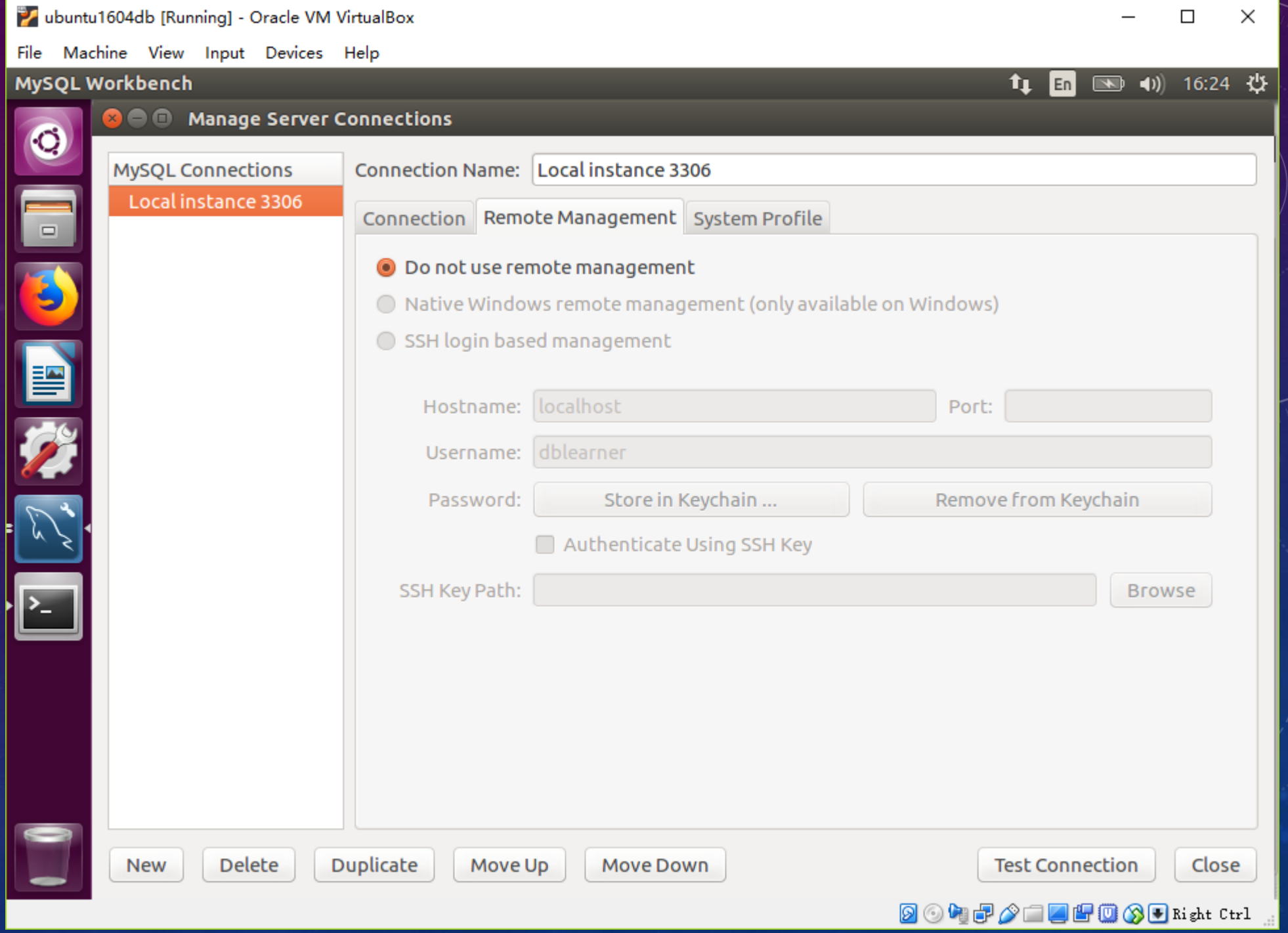
MYSQL: IMPORT DATA OF LABS

- New Connection



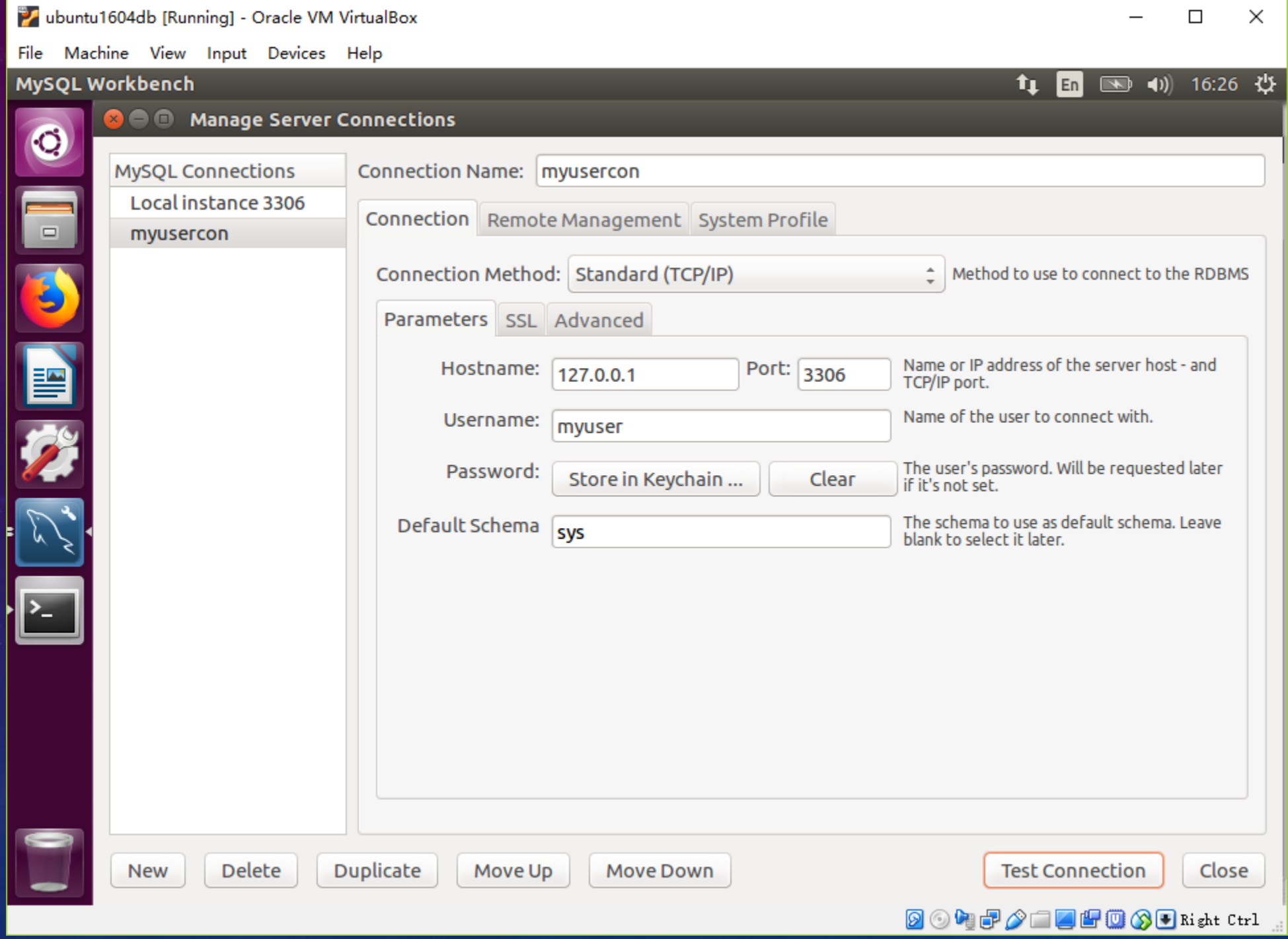
MYSQL: IMPORT DATA OF LABS

- New Connection



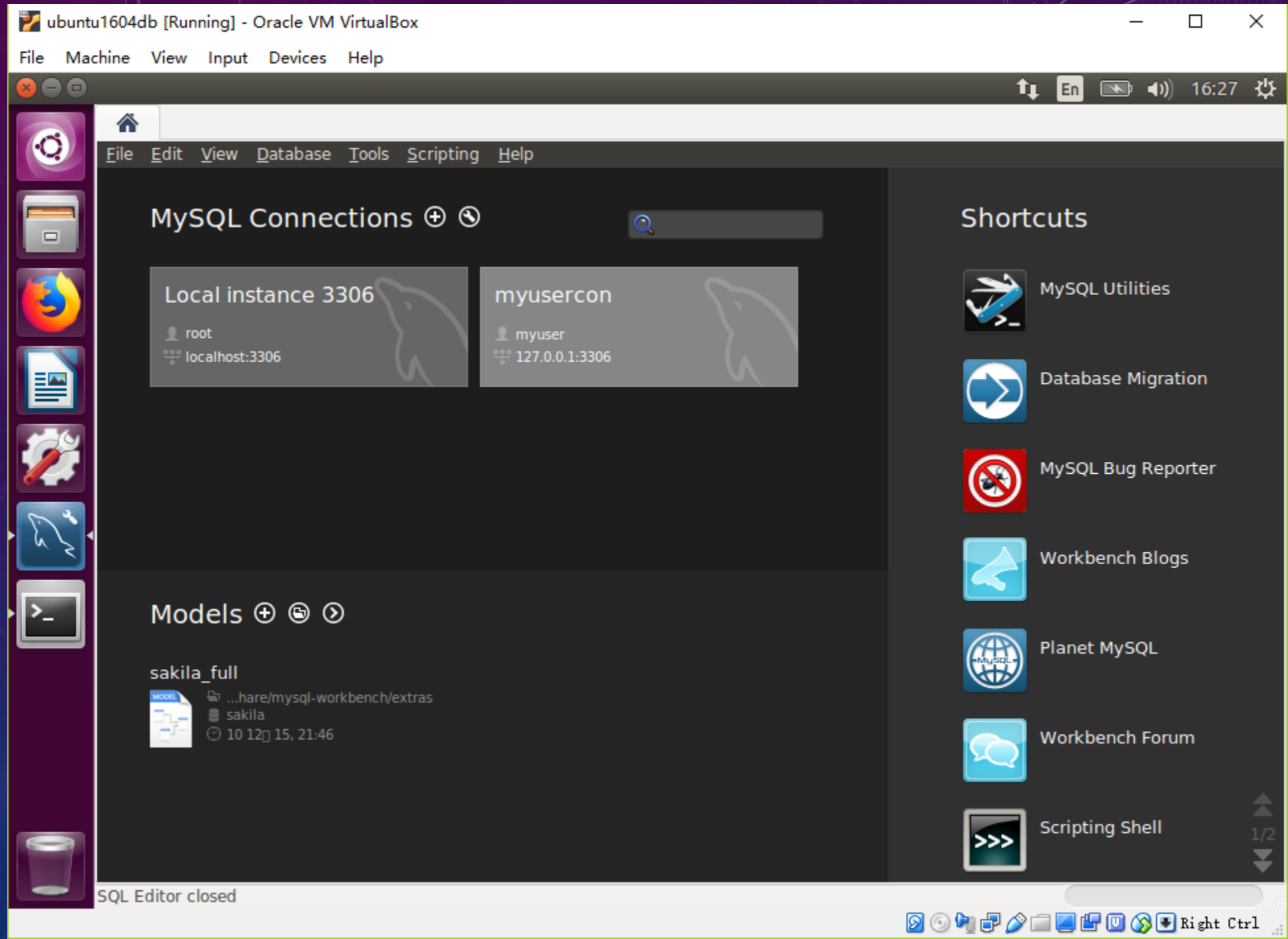
MYSQL: IMPORT DATA OF LABS

- New Connection



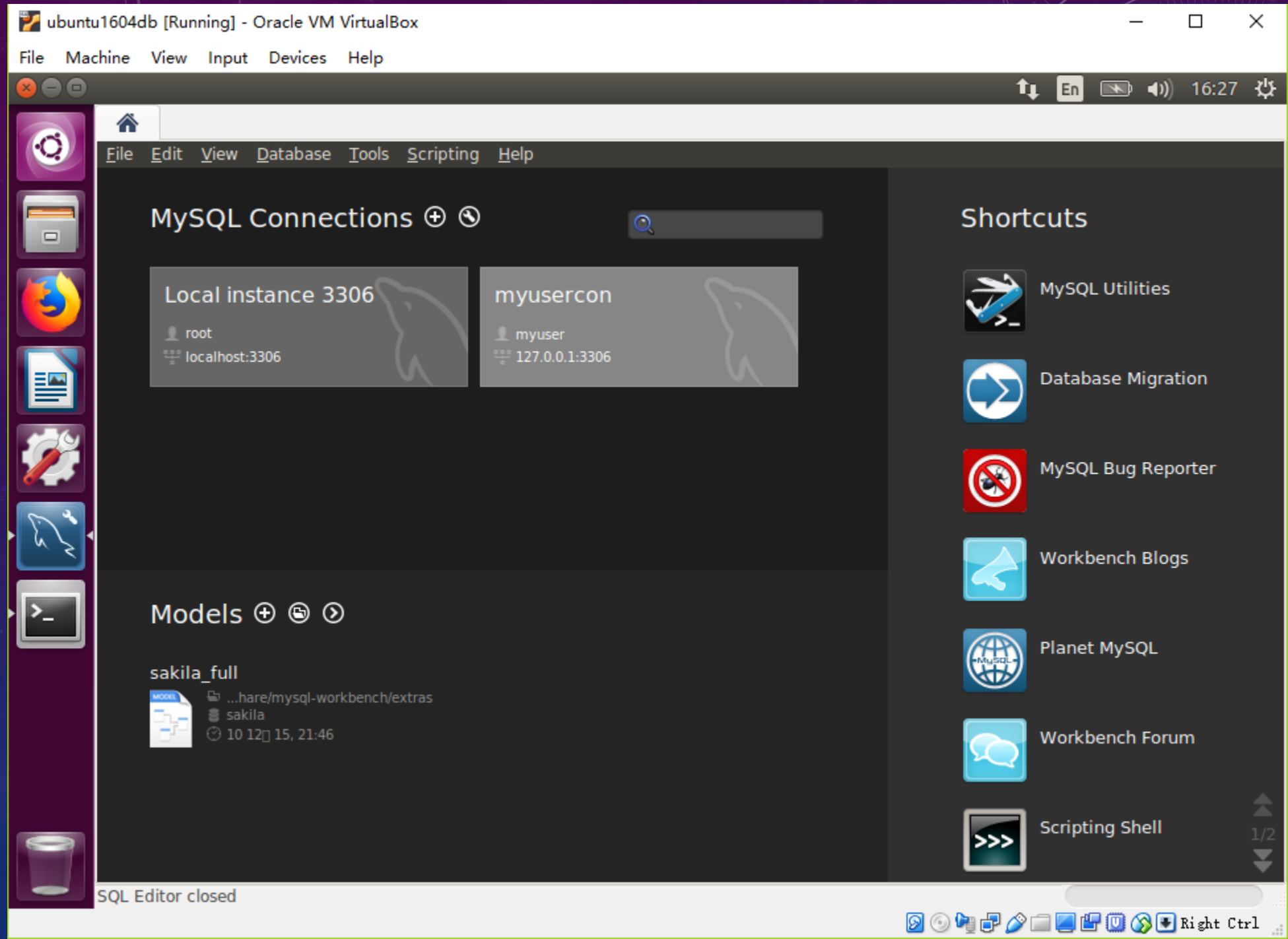
MYSQL: IMPORT DATA OF LABS

- New Connection



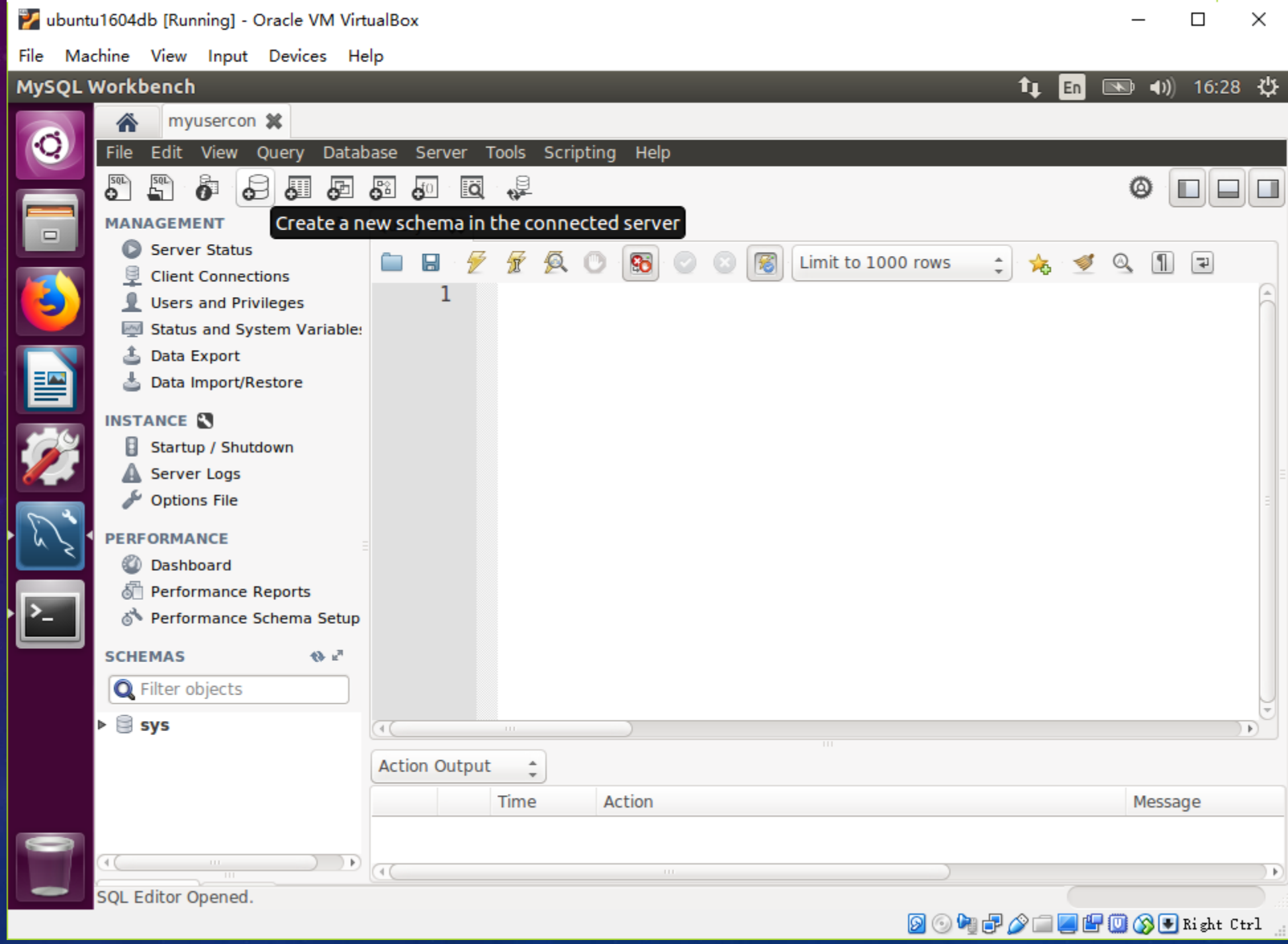
MYSQL: IMPORT DATA OF LABS

- New Connection



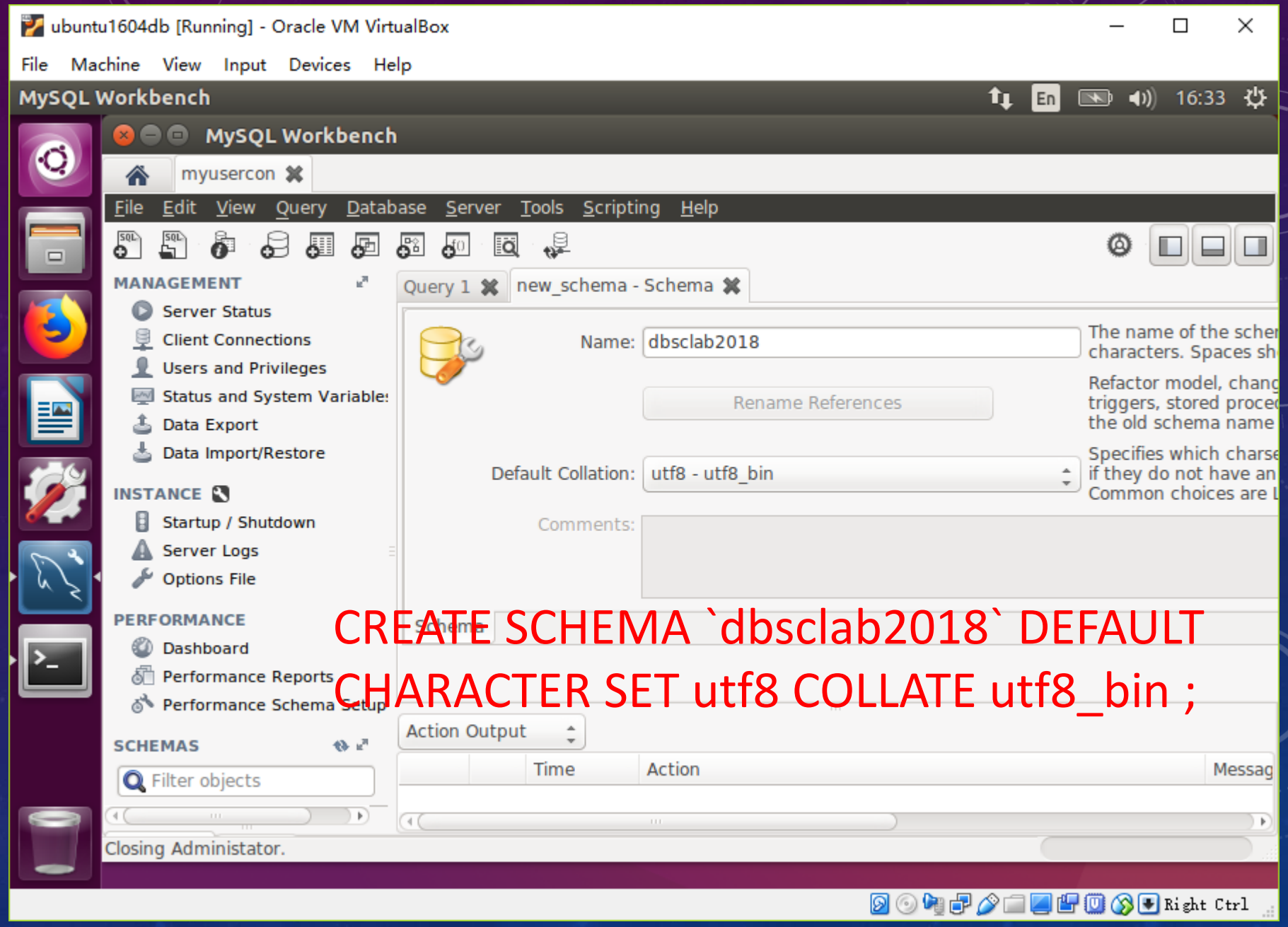
MYSQL: IMPORT DATA OF LABS

- New DB
  - dbsclab2018

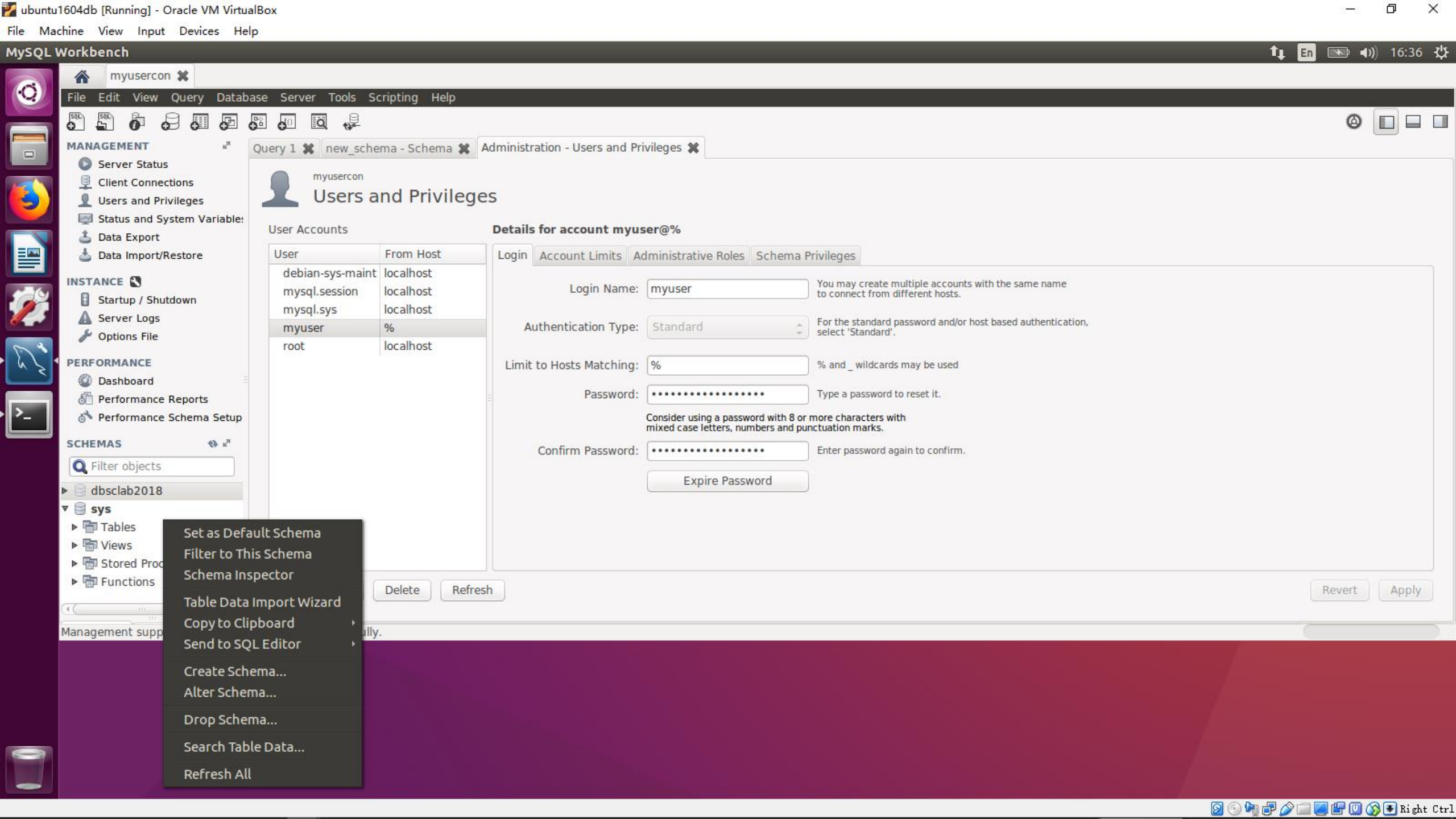


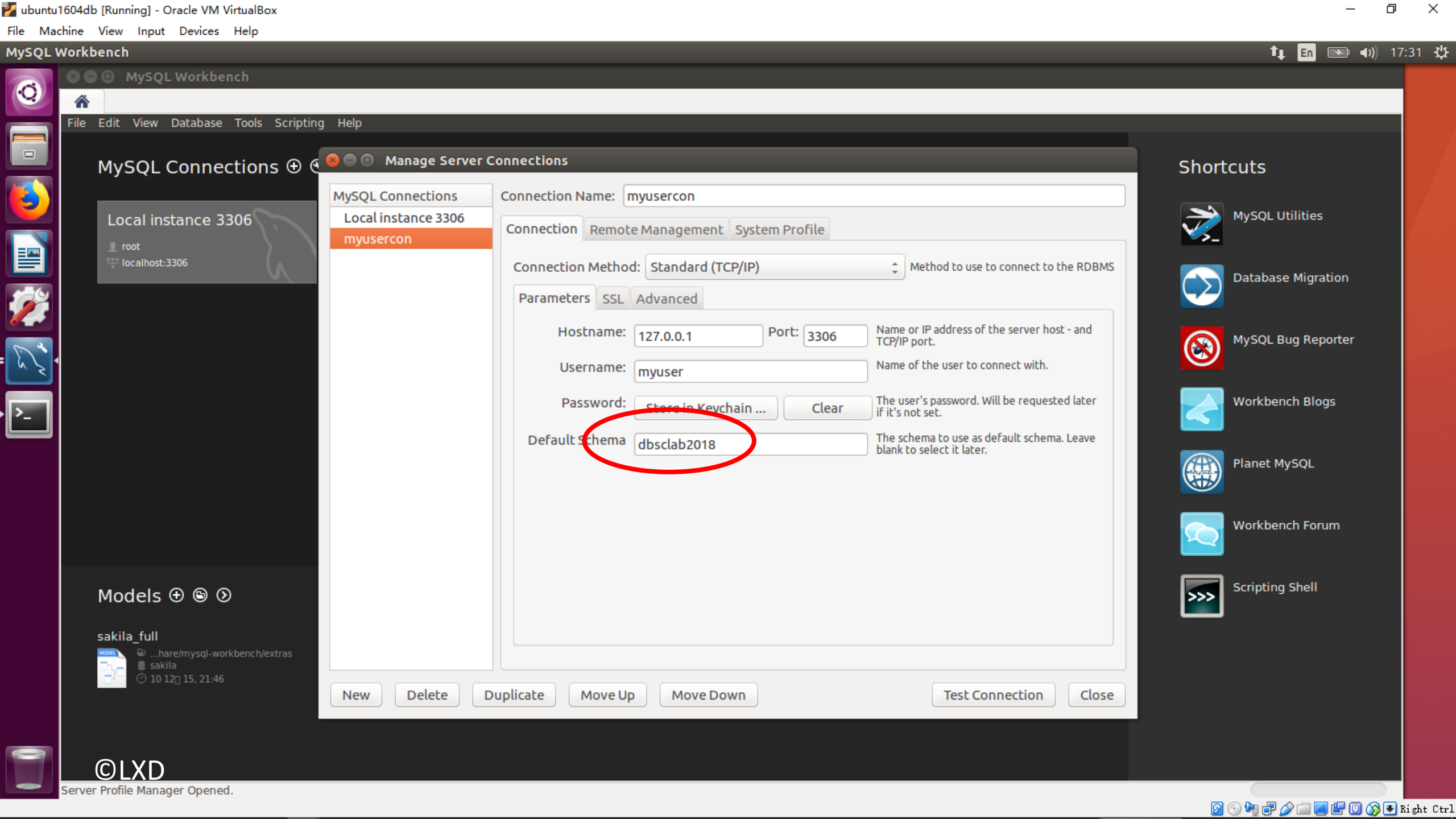
MYSQL: IMPORT DATA OF LABS

- New DB
  - dbsclab2018



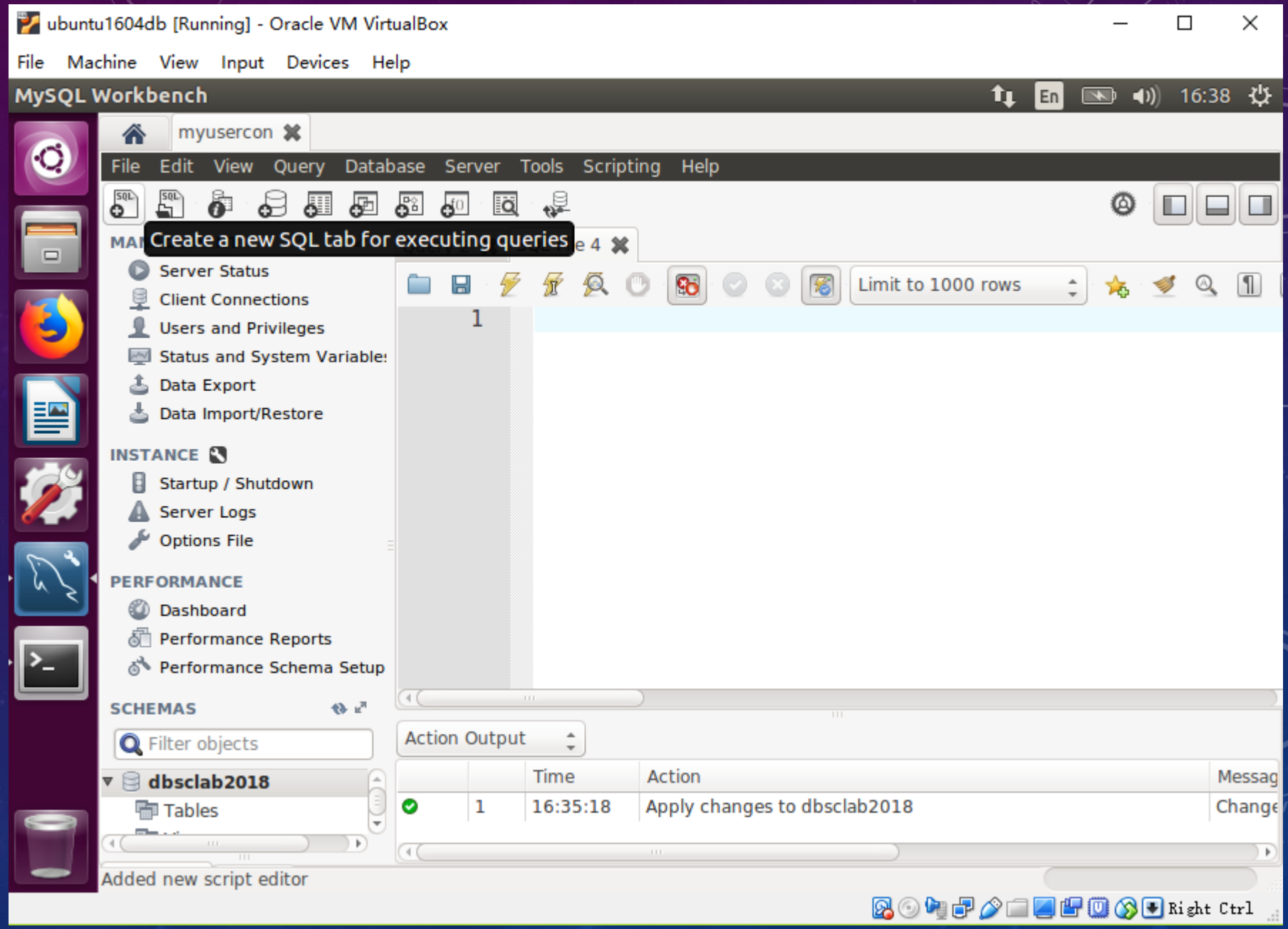
CREATE SCHEMA `dbsclab2018` DEFAULT CHARACTER SET utf8 COLLATE utf8_bin ;


ubuntu1604db [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
MySQL Workbench
16:36
myusercon
File Edit View Query Database Server Tools Scripting Help
MANAGEMENT
Server Status
Client Connections
Users and Privileges
Status and System Variables
Data Export
Data Import/Restore
INSTANCE
Startup / Shutdown
Server Logs
Options File
PERFORMANCE
Dashboard
Performance Reports
Performance Schema Setup
SCHEMAS
Filter objects
dbsclab2018
sys
Tables
Views
Stored Proc
Functions
Query 1
new_schema - Schema
Administration - Users and Privileges
myusercon
Users and Privileges
User Accounts
User
From Host
debian-sys-maint
localhost
mysql.session
localhost
mysql.sys
localhost
myuser
%
root
localhost
Details for account myuser@%
Login
Account Limits
Administrative Roles
Schema Privileges
Login Name:
myuser
You may create multiple accounts with the same name to connect from different hosts.
Authentication Type:
Standard
For the standard password and/or host based authentication, select 'Standard'.
Limit to Hosts Matching:
%
% and _ wildcards may be used
Password:
Type a password to reset it.
Consider using a password with 8 or more characters with mixed case letters, numbers and punctuation marks.
Confirm Password:
Enter password again to confirm.
Expire Password
Delete
Refresh
Revert
Apply
Set as Default Schema
Filter to This Schema
Schema Inspector
Table Data Import Wizard
Copy to Clipboard
Send to SQL Editor
Create Schema...
Alter Schema...
Drop Schema...
Search Table Data...
Refresh All
Right Ctrl


ubuntu1604db [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
MySQL Workbench
17:31
MySQL Workbench
File Edit View Database Tools Scripting Help
MySQL Connections
Local instance 3306
root
localhost:3306
Manage Server Connections
MySQL Connections
Local instance 3306
myusercon
Connection Name: myusercon
Connection
Remote Management
System Profile
Connection Method: Standard (TCP/IP)
Method to use to connect to the RDBMS
Parameters
SSL
Advanced
Hostname: 127.0.0.1
Port: 3306
Name or IP address of the server host - and TCP/IP port.
Username: myuser
Name of the user to connect with.
Password:
Store in Keychain ...
Clear
The user's password. Will be requested later if it's not set.
Default Schema: dbsclab2018
The schema to use as default schema. Leave blank to select it later.
New
Delete
Duplicate
Move Up
Move Down
Test Connection
Close
Shortcuts
MySQL Utilities
Database Migration
MySQL Bug Reporter
Workbench Blogs
Planet MySQL
Workbench Forum
Scripting Shell
Models
sakila_full
...hare/mysql-workbench/extras
sakila
10 12 15, 21:46
©LXD
Server Profile Manager Opened.
Right Ctrl

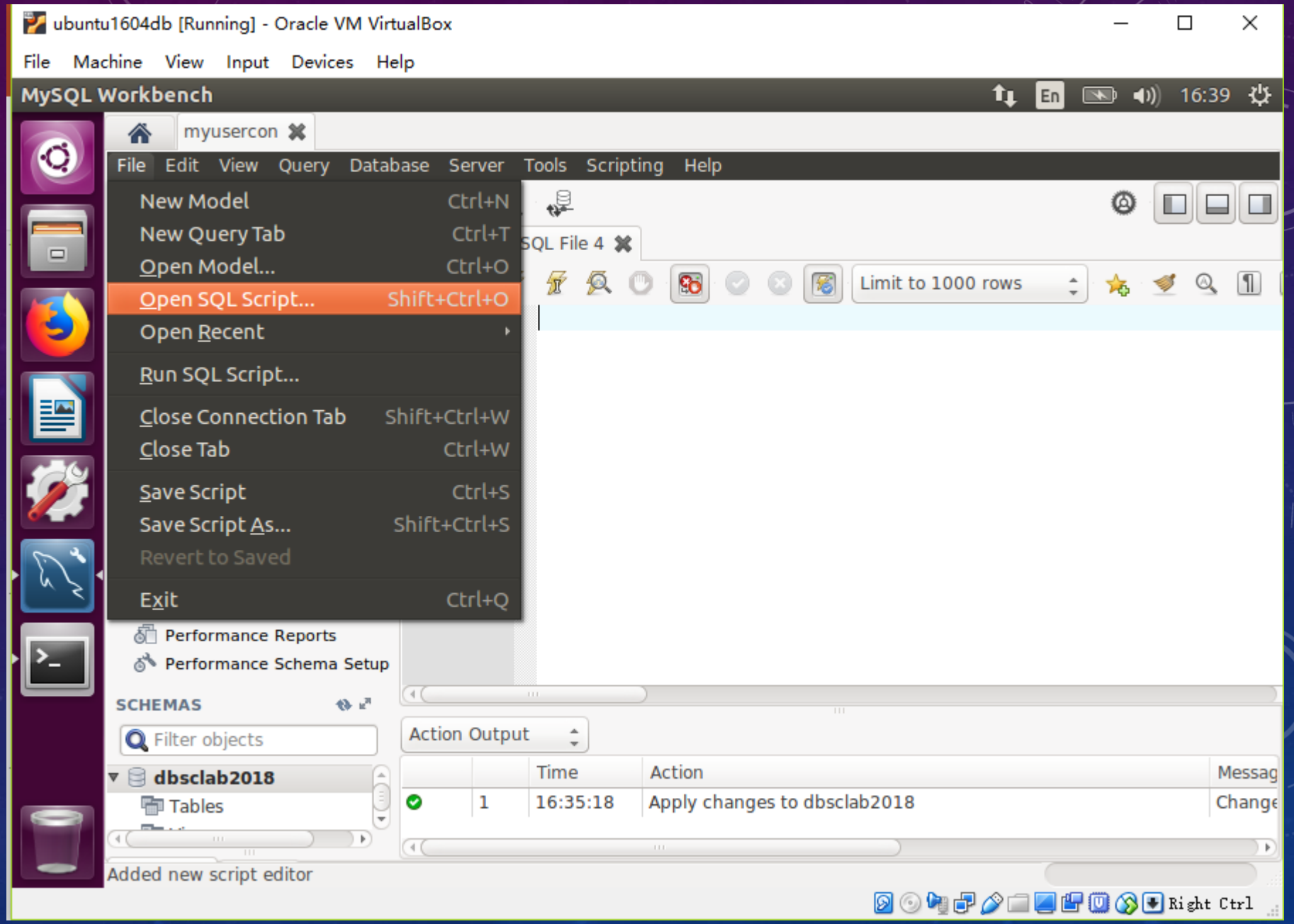
MYSQL: IMPORT DATA OF LABS

- New DB
  - dbsclab2018



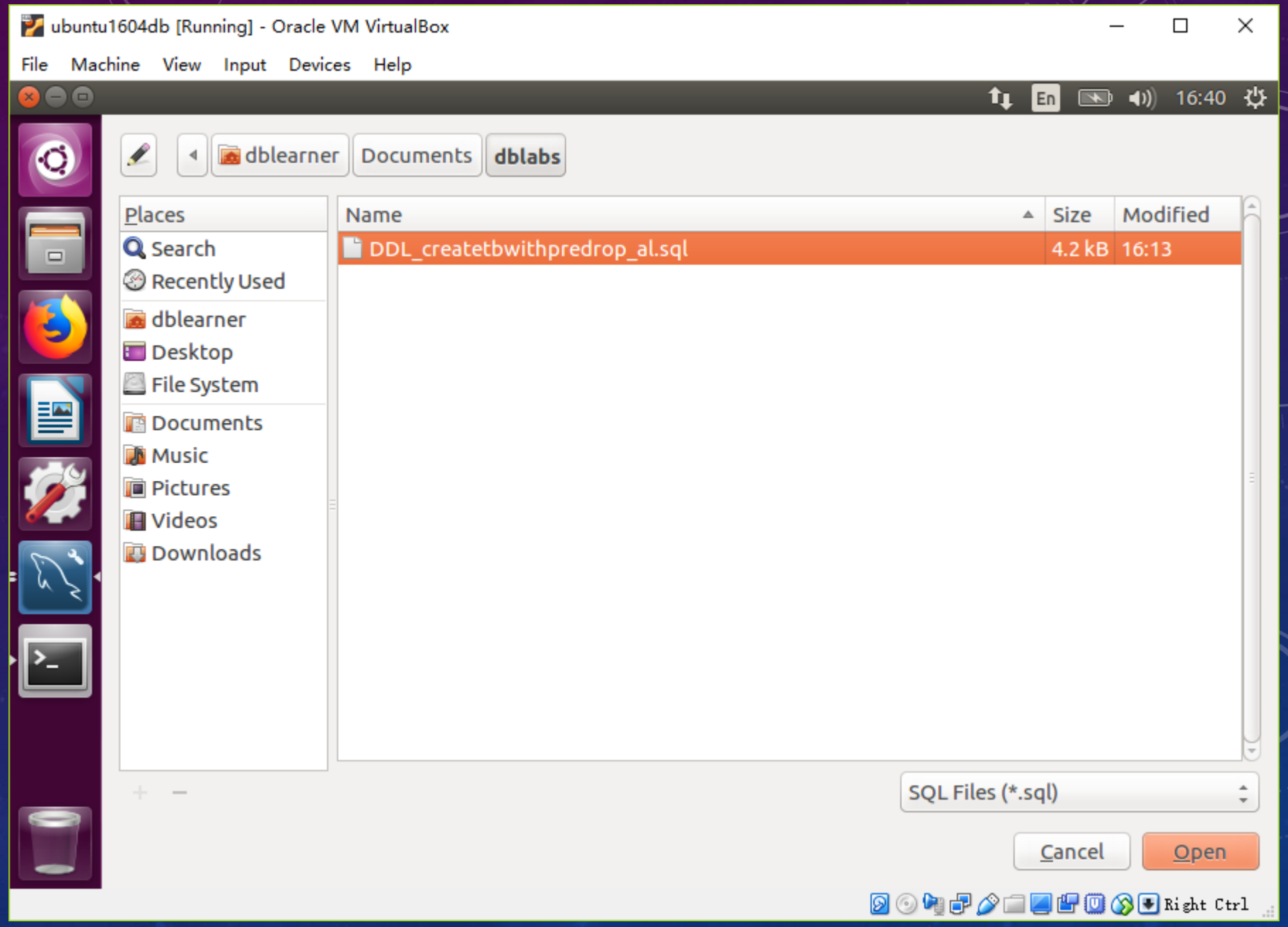
MYSQL: IMPORT DATA OF LABS

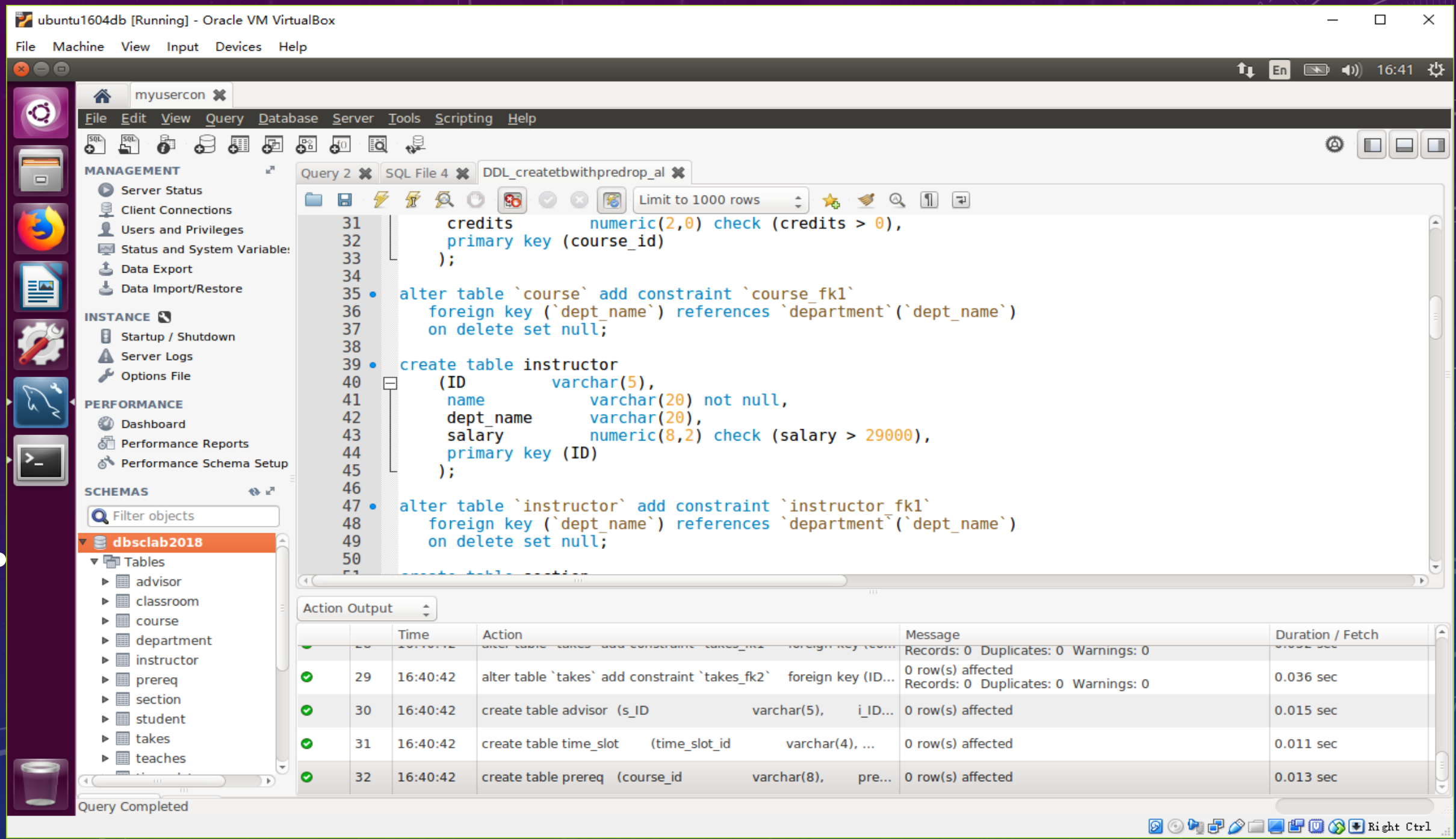
- New DB
  - dbsclab2018



MYSQL: IMPORT DATA OF LABS

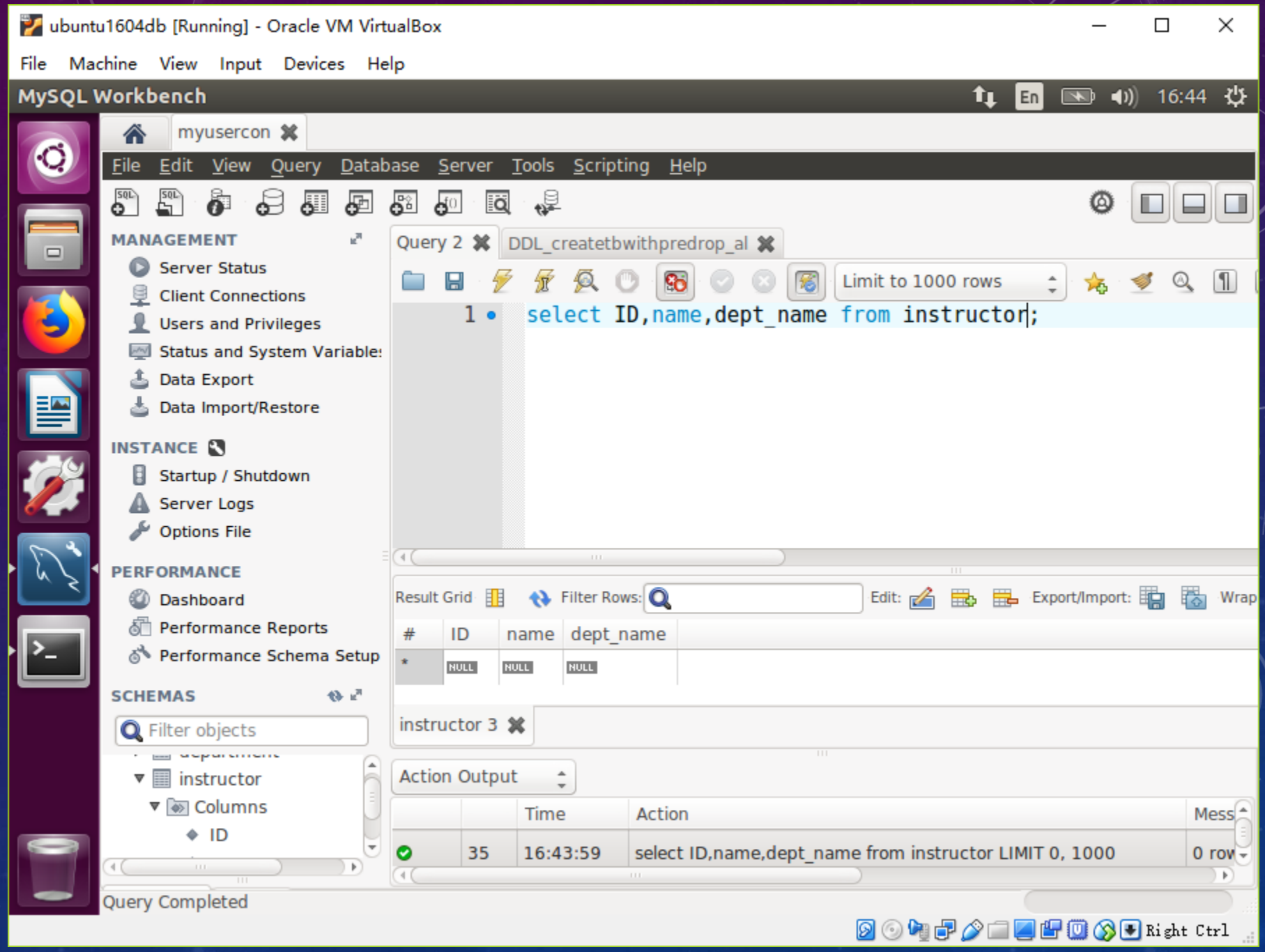
- New DB
  - dbsclab2018




ubuntu1604db [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
16:41
myusercon
File Edit View Query Database Server Tools Scripting Help
MANAGEMENT
Server Status
Client Connections
Users and Privileges
Status and System Variable
Data Export
Data Import/Restore
INSTANCE
Startup / Shutdown
Server Logs
Options File
PERFORMANCE
Dashboard
Performance Reports
Performance Schema Setup
SCHEMAS
Filter objects
dbsclab2018
Tables
advisor
classroom
course
department
instructor
prereq
section
student
takes
teaches
Query 2
SQL File 4
DDL_createtbwithpredrop_al
Limit to 1000 rows
31 credits numeric(2,0) check (credits > 0),
32 primary key (course_id)
33);
34
35 alter table `course` add constraint `course_fk1`
36 foreign key (`dept_name`) references `department`(`dept_name`)
37 on delete set null;
38
39 create table instructor
40 (ID varchar(5),
41 name varchar(20) not null,
42 dept_name varchar(20),
43 salary numeric(8,2) check (salary > 29000),
44 primary key (ID)
45);
46
47 alter table `instructor` add constraint `instructor_fk1`
48 foreign key (`dept_name`) references `department`(`dept_name`)
49 on delete set null;
50
Action Output
Time
Action
Message
Duration / Fetch
Records: 0 Duplicates: 0 Warnings: 0
29 16:40:42 alter table `takes` add constraint `takes_fk2` foreign key (ID... 0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0 0.036 sec
30 16:40:42 create table advisor (s_ID varchar(5), i_ID... 0 row(s) affected 0.015 sec
31 16:40:42 create table time_slot (time_slot_id varchar(4), ... 0 row(s) affected 0.011 sec
32 16:40:42 create table prereq (course_id varchar(8), pre... 0 row(s) affected 0.013 sec
Query Completed
Right Ctrl

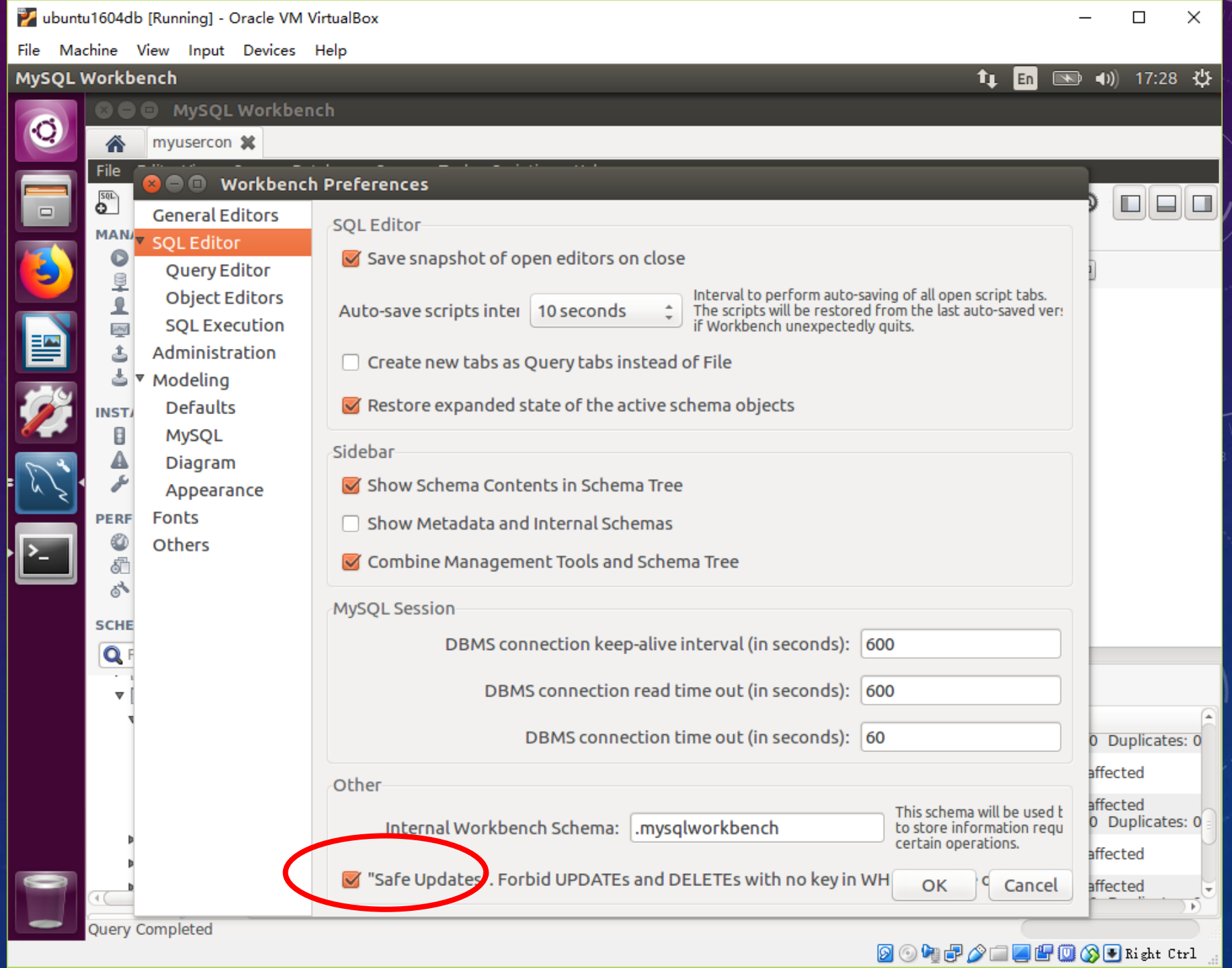
MYSQL: IMPORT DATA OF LABS

- New DB
  - dbsclab2018



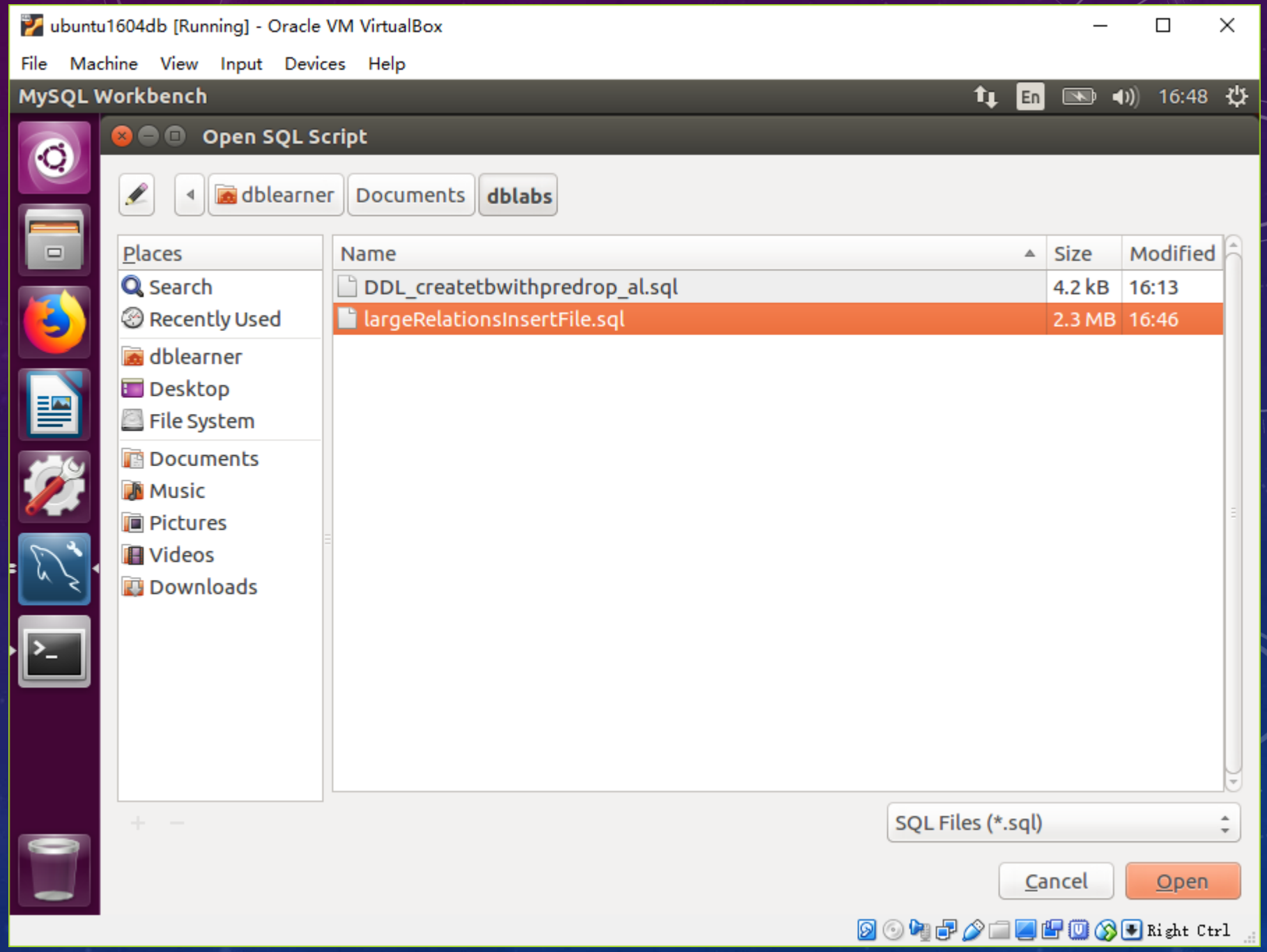
MYSQL: IMPORT DATA OF LABS

- New DB
  - dbsclab2018
  - Disable Safe Updates
  - Restart workbench



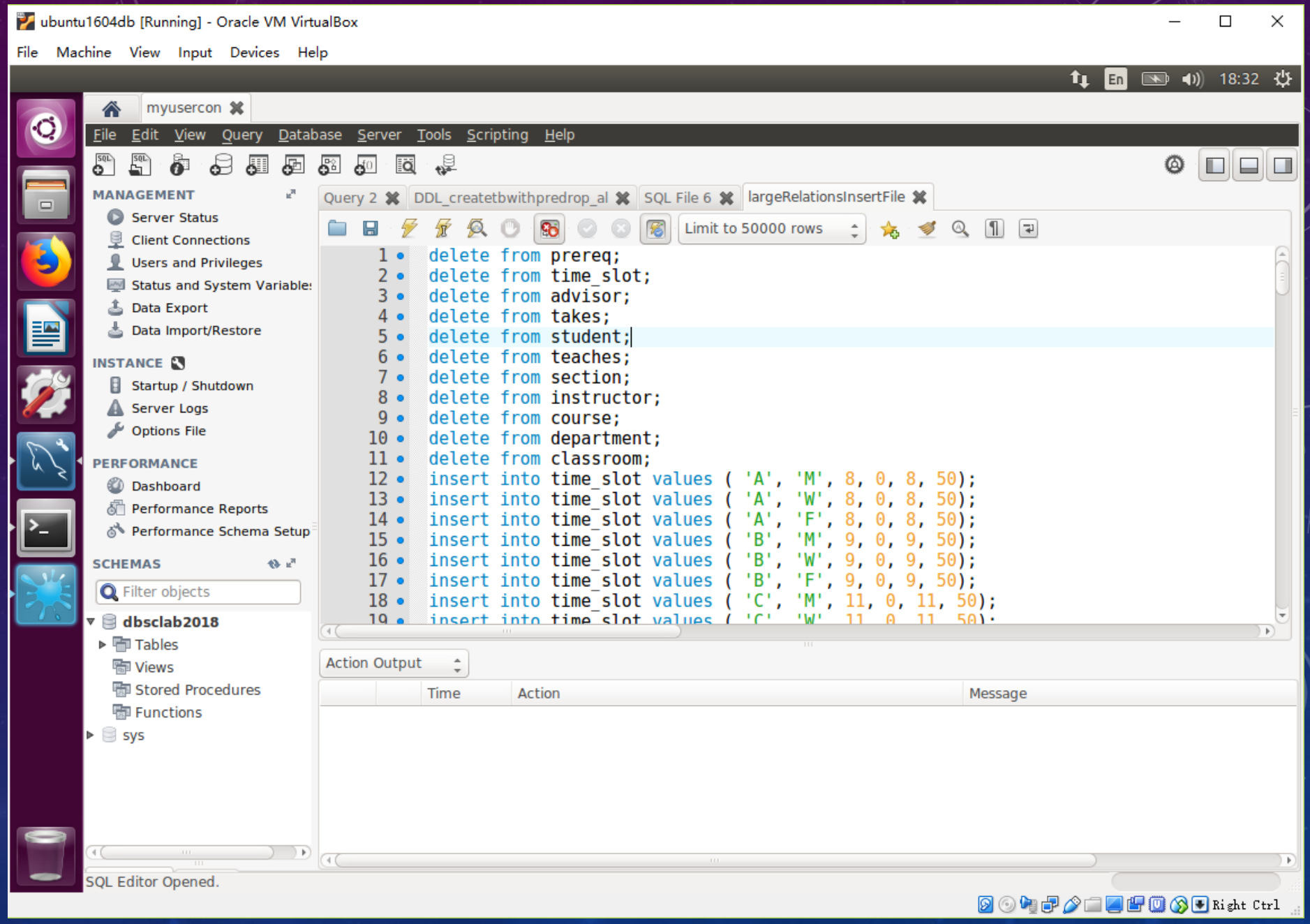
MYSQL: IMPORT DATA OF LABS

- New DB
  - Dbsclab2018
  - Batch import



MYSQL: IMPORT DATA OF LABS

- New DB
  - Dbsclab2018
  - Batch import



MYSQL: IMPORT DATA OF LABS

- New DB
  - Dbsclab2018
  - Batch import

```
$mysql -umyuser -p
show databases;
use dbsclab2018;
source   largeRelationsInsertFile.sql;
commit;
quit;
```

SUMMARY

- Layers of Computer
- Virtual Machine
  - Host OS, Guest OS
- Enterprise Operating System
  - Linux kernel based OSes: Ubuntu
- DB Server
  - MySQL, PostgreSQL, MongoDB
- DB Client: Python

Q&A?

THANKS!

leexudong@nankai.edu.cn