9

Archiving, Compressing, and Performing Remote File Transfers

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Objectives

After completing this lesson, you should be able to:

- Archive and retrieve files
- Compress, view, and uncompress files
- Perform remote connections and file transfers

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Agenda

- Archiving and retrieving files
- Compressing, viewing, and uncompressing files
- Performing remote connections and file transfers

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File Archival: Introduction

- To safeguard your files and directories, you can create a copy of all the files and directories in your file system.
- This copy is a repository of files and directories and is called an archive.
- The archive serves as backup in the event of data loss.
- You can create an archive on a storage device, such as a remote disk or tape or you can send your archive to the cloud.
- Of the many commands, the `tar` command is the most commonly used for creating and retrieving archived files.

Note: It is a good practice to use relative path names to archive files.

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The tar Command

- The tar command creates, adds, deletes, lists, or extracts files in a tape archive file.

```
$ tar [options] archivefile filenames
```

- The output of using a tar command is a tar file.
- The default output location for a tar file in UNIX and Linux is stdout.
- For more information about the tar command options, see the tar man page.

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The Common `tar` Command Options

Option	Description
c	Creates a new `tar` file
t	Lists the table of contents of the `tar` file
x	Extracts files from the `tar` file
f	Specifies the archive file or tape device.
v	Executes in verbose mode; writes to the standard output
h	Follows symbolic links as standard files or directories
z	Compresses and extracts files and directories by using `gzip`
j	Compresses and extracts files and directories by using `bzip2`

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Creating a `tar` Archive

- You can use the `tar` command to create an archive file containing multiple files or directories on a disk or in a single file.
- The following example shows you how to archive your home directory on a disk:

```
$ tar [-]cvf /dev/rmt/0 .
a ./ 0 tape blocks
a ./.rhosts 1 tape blocks
...(output truncated)
```

- The following example shows you how to archive multiple files into an archive file called `files.tar`:

```
$ tar [-]cvf files.tar file1 file2 file3
a file1 2K
a file2 1K
a file3 1K
```

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Viewing the Table of Contents of a tar Archive

- You can view the names of all the files that have been written directly to a disk or an archive file.
- To view the table of contents of Oracle's home directory on the disk, enter the following command:

```
$ tar [-]tf /dev/rmt/0
/.rhosts
./dante
./fruit
...(output truncated)
```

- To view the verbose content of the files.tar archive file, enter the following command:

```
$ tar [-]tvf files.tar
-rw-rw-r-- oracle/oracle  1610 ... file1
-rw-rw-r-- oracle/oracle   105 ... file2
...(output truncated)
```

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Extracting a `tar` Archive

- You can retrieve or extract the entire contents of an archive or a single file that was written directly to a disk device or to an archive file.
- To retrieve all the files from the disk archive, enter the following command:

```
$ tar [-]xvf /dev/rmt/0
x ., 0 bytes, 0 tape blocks
x ./.rhosts, 2 bytes, 1 tape blocks
...(output truncated)
```

- To extract or restore a single file from the `files.tar` archive file, enter the following command:

```
$ tar [-]xvf files.tar file1
x file1, 1610 bytes, 4 tape blocks
```

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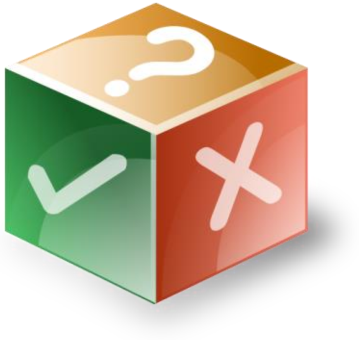
Quiz

Which command do you use to view the table of contents of the archive file named `file8.tar`?

a. `tar xvf file8.tar`

b. `tar cvf file8.tar`

c. `tar tf file8.tar`



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Agenda

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- Compressing, viewing, and uncompressing files
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File Compression

- With the enormous amount of enterprise data that is created and stored, there is a pressing need to conserve disk space and optimize data transfer time.
- There are various tools, utilities, and commands that are used for file compression. Some of the more commonly used commands are:
  - The `gzip` command
  - The `zip` command
  - The `bzip2` command

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Compressing a File: `gzip` Command

- Use the `gzip` command to compress files:

```
$ gzip [options] filename(s)
```

- For example, to compress a set of files, `file1`, `file2`, `file3`, and `file4`, enter the following command:

```
$ gzip file1 file2 file3 file4
$ ls *.gz
file1.gz file2.gz file3.gz file4.gz
```

- For more information about the `gzip` command options, see the `gzip` man page.

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Uncompressing a File: `gunzip` Command

- The `gunzip` or `gzip -d` command uncompresses a file that has been compressed by using the `gzip` command:

```
$ gunzip [options] filename
```

- To uncompress or decompress the `file1.gz` file, use the following command:

```
$ gunzip file1.gz
or
$ gzip -d file1.gz
```

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Viewing a Compressed File: `zcat` Command

- In Oracle Linux, the `zcat` command prints the uncompressed form of a compressed file to `stdout`.

```
$ zcat [options] filename
```

- To view the content of the `dante.gz` compressed file, enter the following command:

```
[oracle@ol7-server1 lab]$ zcat dante.gz | less
The Life and Times of Dante
by Dante Pocai
Mention "Alighieri" and few may know about whom you are talking.
Say "Dante," instead, and the whole world
...(output truncated)
```

Note: The `zcat` command interprets the compressed data and displays the content of the file as if it were not compressed.

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Viewing a Compressed File: gzcat Command

- In Oracle Solaris, the gzcat command displays the content of files that were compressed with the gzip command to stdout.

```
$ gzcat [options] filename
```

- To view the file1.gz file, use the following command:

```
[oracle@s11-server1:~/lab]$ gzcat file1.gz
The Achievers
Unconsciously or not, they divide their work totally
differently than the sustainers do. Certainly Achievers work
longer hours. New York magazine has published several surveys
on work needs which reveal that well-known typically work from
...(output truncated)
```

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Archiving and Compressing Multiple Files: `zip` Command

- The `zip` command archives and compresses multiple files into a single archive file, and is compatible with files created with `pkzip`.

```
$ zip [options] archivefile filename(s)
```

- To compress `file2` and `file3` into the `file.zip` archive file, enter the following:

```
$ zip file.zip file2 file3
adding: file2 (deflated 16%
adding: file3 (deflated 26%)
$ ls
file.zip
file2
file3
```

- For more information about the `zip` command options, see the `zip` man page.

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Viewing and Uncompressing Archive Files: `unzip` Command

- The `unzip` command is used for listing the files and also for extracting the content of a compressed `.zip` file.

```
$ unzip [options] archivefile
```

- To uncompress the `file.zip` archive file, use the following command:

```
$ unzip file.zip
```

- For more information about the `unzip` command options, see the `unzip` man page.

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Compressing a File: bzip2 Command

- Use the bzip2 command to compress files.

```
$ bzip2 [options] filename(s)
```

- For example, to compress a set of files, file1, file2, file3, and file4, enter the following command:

```
$ bzip2 file1 file2 file3 file4
$ ls *.bz2
file1.bz2 file2.bz2 file3.bz2 file4.bz2
```

- For more information about the bzip2 and bunzip2 command options, see the bzip2 man page.

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Uncompressing a File: `bunzip2` Command

- The `bunzip2` command uncompresses a file that has been compressed with the `bzip2` command.

```
$ bunzip2 [options] filename
```

- To uncompress the `file1.bz2` file, use the following command:

```
$ bunzip2 file1.bz2
```

- For more information about the `bunzip2` command options, see the `bunzip2` man page.

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Viewing a Compressed File: `bzcat` Command

- The `bzcat` command prints the uncompressed form of a compressed file to `stdout`.

```
$ bzcat [options] filename
```

- To view the content of the `dante.bz2` compressed file, enter the following command:

```
$ bzcat dante.bz2 | less
The Life and Times of Dante
by Dante Pocai
Mention "Alighieri" and few may know about whom you are talking.
Say "Dante," instead, and the whole world
...(output truncated)
```

Note: The `bzcat` command interprets the compressed data and displays the content of the file as if it were not compressed.

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Quiz

Which command has packaging and compression capabilities, in addition to archiving features?

a. The `tar` command

b. The `zip` command

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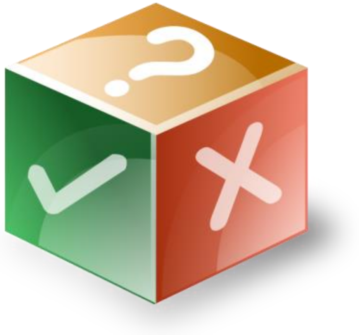
Quiz

The Oracle Solaris `gzcat` command is used for viewing files that have been compressed by using the `gzip` command.

a. True

b. False



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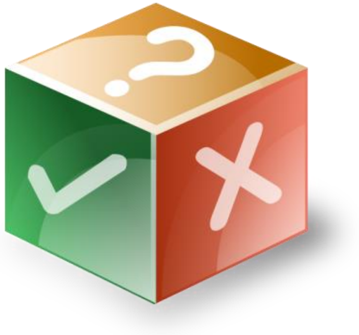
Quiz

What is the output of the `zip file7.zip file4 file12` command?

a. An error message: The files must be compressed separately, one per `zip` command.

b. `file7.zip`, `file4.zip`, and `file12.zip`: The compressed versions of each file

c. `file7.zip`: The packaged and compressed zip file that contains two compressed files, `file4` and `file12`



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Practice 9: Overview

This practice covers the following topics:

- 9-1: Archiving and retrieving files
- 9-2: Compressing and restoring files
- 9-3: Performing remote connections and file transfers

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Agenda

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Computer Networking: Introduction

- A computer network is a group of computer components connected with each other by communication channels that allows sharing of resources and information.
- A computer system on a network is called a **host** which could be a Personal Computer (PC) client, a server, or a piece of network hardware such as a bridge, router, or a switch.
  - The **local host** is your current working system, usually a PC client or the server you are connected to.
  - A **remote hos**t is a different system, usually a server that you access from your local host.

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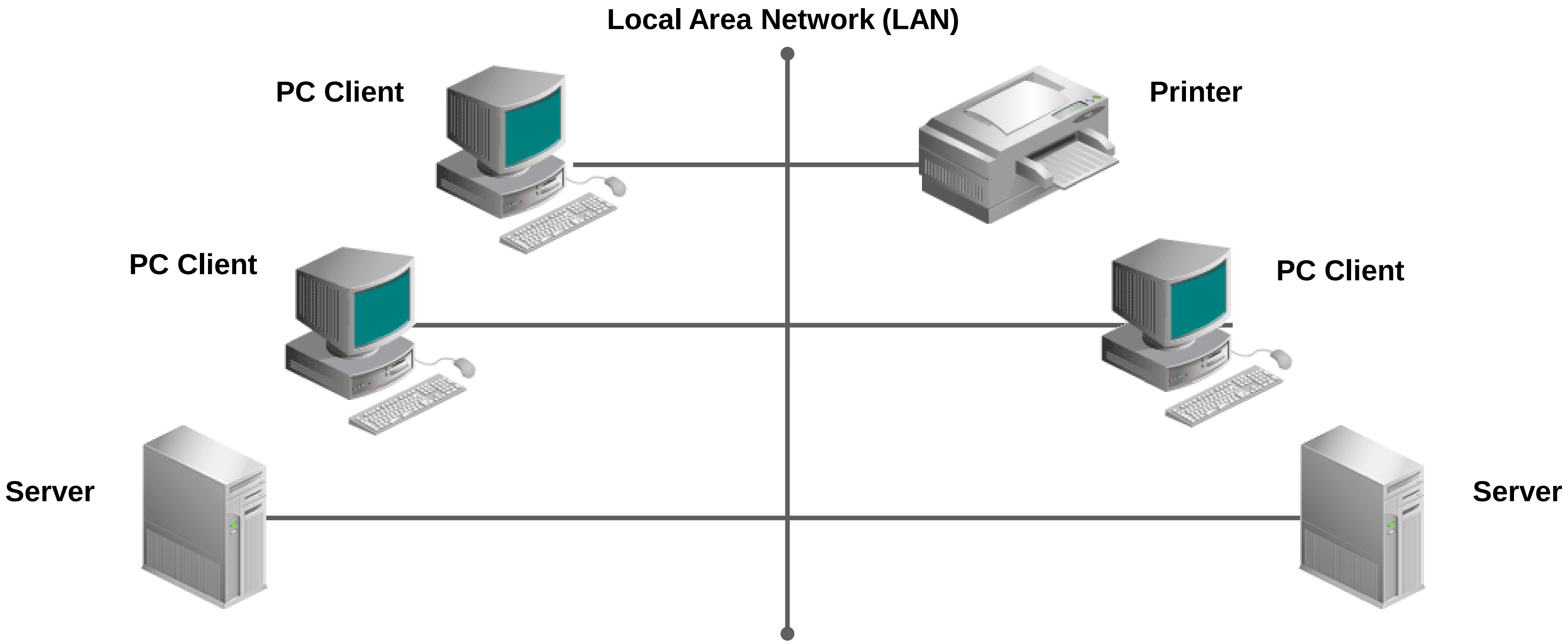
Layout of a Basic Network



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OpenSSH and Remote Network Connections

- OpenSSH (also known as OpenBSD Secure Shell) is a suite of network security utilities using the Secure Shell (SSH) network protocol.
- The utilities in the suite of OpenSSH packages provide:
  - `sshd` (a secure shell server daemon), which provides a secure end-to-end encrypted connection in an unsecure network
  - `ssh` (secure shell), which connects a client to a server
  - `scp` (secure copy), which copies files securely
  - `sftp` (secure ftp), which provides a secure file transfer protocol connection
- Remote login network connections can occur between a *client* machine and a *server* running `sshd` and between one *server* to another *server* running `sshd`.
- Each new connection/session is authenticated with a username and password.
- Once the session is authenticated and established, both the local and remote hosts communicate with each other via the Secure Shell (SSH) network protocol.

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Using Secure Shell (`ssh`) for Remote Login

- The SSH network protocol provides a secure encrypted communication between two untrusted hosts over an unsecure network.
- The `ssh` (secure shell) client command allows you to connect and log in to a specified remote host.

```
$ ssh [options] [-l login_name | username@]hostname [command]
```

- `ssh` can use public-key encryption to authenticate a remote login session.
  - In public-key encryption, the `ssh-keygen` command generates a public-key that can be copied to all hosts that intend to communicate with the holder of the matching private-key.
- For more information about the `ssh` command options, see the `ssh` man page.

Note: In Oracle Solaris and Oracle Linux, OpenSSH is installed by default and is usable.

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Copying Files and Directories Between a Local and Remote Host: scp Command

- The scp (secure copy) command securely copies files and directories both ways between a local and a remote host.
- To copy files from a local directory to a remote host, use the following command syntax:

```
$ scp [options] SourceFile [username@]hostname:/directory/TargetFile
```

- To copy the dante file from the local directory to the /tmp directory on a remote system called host2, as the logged in user, enter the following command:

```
$ scp dante host2:/tmp
```

- For more information about the scp command options, see the scp man page.

Note: The **[username@]** syntax is needed only when connecting as a different user other than the logged in user and requires that you know that user’s password.

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Reversing the Direction and Copying Files from a Remote Host to a Local Host

- To copy files from a remote host to a local directory, use the following command syntax:

```
$ scp [username@]hostname:/directory/SourceFile TargetFile
```

- To copy the `dante` file from a remote host called `host2` to the local `/tmp` directory, as the logged in user, enter the following command:

```
$ scp host2:/tmp/dante /tmp
```

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Copying Local Directories to and from a Remote Host

- The `scp` command with the `-r` option recursively copies entire directories to and from another system.
- To copy the `perm` subdirectory in the local home directory to the `/tmp` directory on the remote system called `host2`, as the logged in user, enter the following command:

```
$ scp -r ~/lab/perm host2:/tmp
```

- To reverse the direction of the copy from the remote host to a local directory:

```
$ scp -r host2:/tmp ~/lab/perm
```

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Quiz

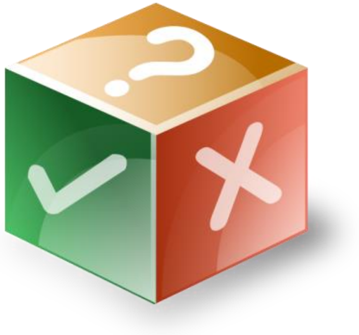
Identify the correct command to copy the `/opt/dante` file from a remote host to the `/tmp` directory in your system.

a. `scp [username@]host2:/dante/tmp`

b. `dante scp [username@]host2:/tmp`

c. `[username@]host2/scp dante:/tmp`

d. `scp [username@]host2:/opt/dante /tmp`



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File Transfer Protocol (FTP): Introduction

- The File Transfer Protocol (FTP) is a network protocol used for exchanging files over a TCP/IP network, not to be confused with the `ftp` userspace command.
- FTP implements user-based password authentication.
- FTP also allows anonymous user access, where the password is usually a valid email address.
- You can access a remote server for exchanging files securely using the `sftp` command:

```
$ sftp [options] [username@]hostname
```

- For more information about the `sftp` command options, see the `sftp` man page.

Note: Although Oracle Solaris has both the `ftp` and the `sftp` client software, in this course, we will use only the more secure `sftp` client software found on Oracle Linux.

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Using OpenSSH’s `sftp` to Transfer Files Either Remotely or Locally

- The `sftp` (secure ftp) command is an interactive file transfer program and performs all operations, such as file access, transfer, and management over an encrypted SSH transport.
- Being an extension of the OpenSSH protocol, `sftp` can use many of the features of SSH, such as public key authentication and encryption to enforce security.
- `sftp` only uses the `binary` transfer mode which is a byte-for-byte transfer mode.

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Before Using `sftp` to Transfer Files, One Needs to Know the File Type and the Destination to Which the File Is Being Transferred

- In the lesson titled “Working with Files and Directories,” you learned how to determine a file’s file type by using the `file` command.

```
$ file dante
dante: ASCII English text
```

- Although dante’s file type is `ASCII English text`, that *file type* has different characteristics on different operating systems.
- The symbol that is used to represent the end-of-line or newline varies from:
  - Mac pre OS X, which uses `CR` (a single character--`carriage return`) to
  - Mac OS X, which uses the same `^M` used by UNIX and Linux to
  - Microsoft, which uses `CRLF` (a double character--`carriage return` plus `line feed`) to
  - UNIX and Linux, which uses `^M` (a single character--`Ctrl-M`)
- Before a file can be transferred, its format may need to be converted based on the destination to which the file is being transferred.

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Using `dos2unix` or `unix2dos` Commands to Convert the File’s Format Based on the Destination to Which the File is Being Transferred

- If the file is being transferred from Microsoft to UNIX, Linux, or MAC, then you need to use the `dos2unix` command:

```
$ dos2unix dante
dos2unix: converting the file dante to Unix format ...
```

- If the file is being transferred from UNIX, Linux, or MAC to Microsoft, then you need to use the `unix2dos` command:

```
$ unix2dos dante
unix2dos: converting the file dante to DOS format ...
```

- As the file is being converted to a new format, the original file is overwritten.
- For more information about the `dos2unix` and `unix2dos` command options, see the `dos2unix` man page.

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Using the `sftp` Commands

The following are some of the frequently used `sftp` commands:

- `open`: Opens a connection to another computer on the network
- `get`: Transfers a file from the remote system to the local system’s current directory
- `put`: Transfers a file from the local system to a directory on the remote system
- `mget`: Transfers multiple files from the remote system to the local system’s current directory
- `mput`: Transfers multiple files from the local system to a directory on the remote system
- `bye`, `exit`, and `quit`: Quit or close the `sftp` environment

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Transferring Files Using `sftp`

```
[oracle@ol7-server1 ~] $ sftp s11-server
Password:
Connected to s11-server1.
sftp> pwd
Remote working directory: /home/oracle
sftp> ls lab/dante
lab/dante
sftp> get lab/dante
Fetching /home/oracle/lab/dante dante
/home/oracle/lab/dante                              100%  1319     1.3KB/s   00:00
sftp> lpwd
/home/oracle
sftp> lls
dante   Desktop   Downloads    Public    lab     Music   ...
sftp> bye
[oracle@ol7-server ~] $
```

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Transferring Multiple Files Using `sftp`

```
[oracle@s11-server1:~] $ sftp ol711-server
Password:
Connected to ol7-server1...
oracle@ol7-server1’s password:
sftp> pwd
Remote working directory: /home/oracle
sftp> ls lab/fil*
lab/file.1     lab/file.2     lab/file.3     lab/file.4     lab/file1
lab/file2      lab/file3      lab/file4
sftp> get lab/fil*
Fetching /home/oracle/lab/file.1  file.1
Fetching /home/oracle/lab/file.2  file.2
Fetching /home/oracle/lab/file.3  file.3
Fetching /home/oracle/lab/file.4  file.4
Fetching /home/oracle/lab/file1  file1
/home/oracle/lab/file1        100%  1610    1.6KB/s        00:00
```

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Transferring Multiple Files Using `sftp`

```
Fetching /home/oracle/lab/file2  file2
/home/oracle/lab/file2        100%    105   0.1KB/s        00:00
Fetching /home/oracle/lab/file3  file3
/home/oracle/lab/file3        100%    218   0.2KB/s        00:00
Fetching /home/oracle/lab/file4  file4
home/oracle/lab/file4         100%    137   0.1KB/s        00:00
sftp> lpwd
/home/oracle
sftp> lls
dante  Documents Desktop   Downloads file.1    file.2
file.3 file.4    file1     file2     file4     lab ...
sftp> bye
[oracle@s11-server1:~] $
```

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Quiz

Which is the most secure command for remotely logging in to another system within the network?

a. rsh

b. ssh

c. telnet

d. ftp

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Quiz

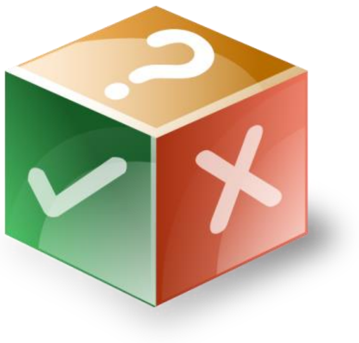
Select the three correct `sftp` command syntaxes to end an FTP session.

a. `sftp> exit`

b. `sftp> quit`

c. `sftp> close`

d. `sftp> bye`



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Summary

In this lesson, you should have learned how to:

- Archive and retrieve files
- Compress, view, and uncompress files
- Perform remote connections and file transfers

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Practice 9: Overview

This practice covers the following topics:

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