Lesson 4

Hardware and Software

Study Questions

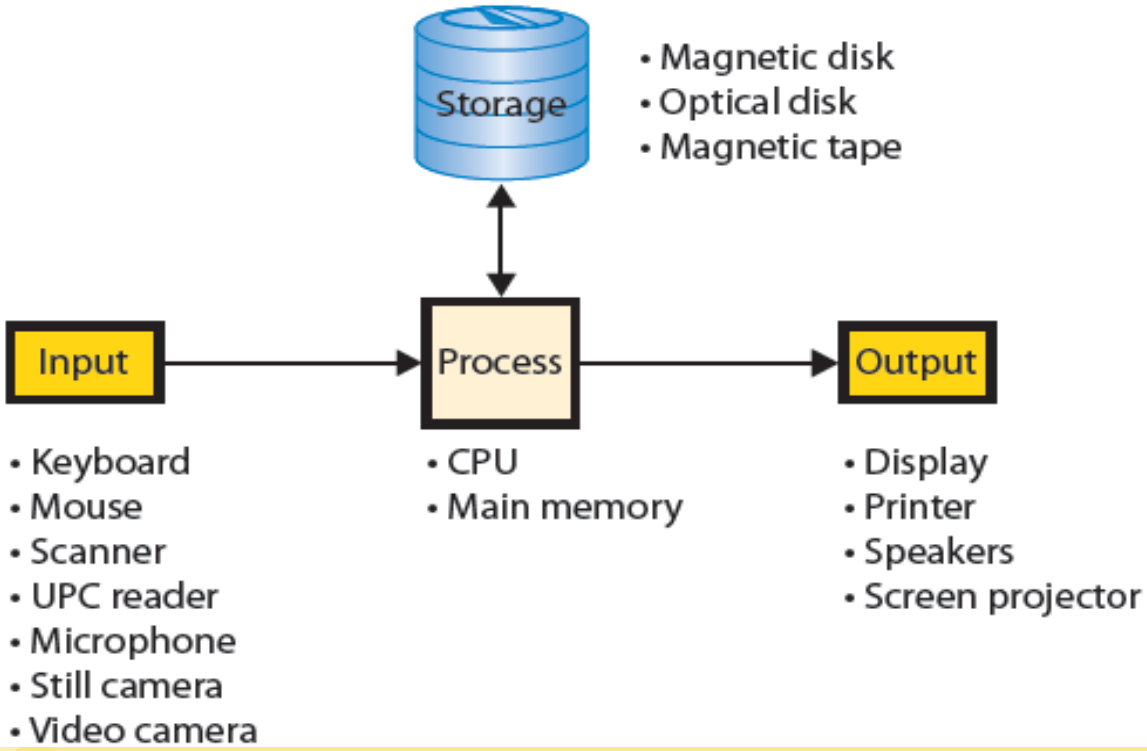
Q1: What do business professionals need to know about computer hardware?

Q2: What do business professionals need to know about operating systems software?

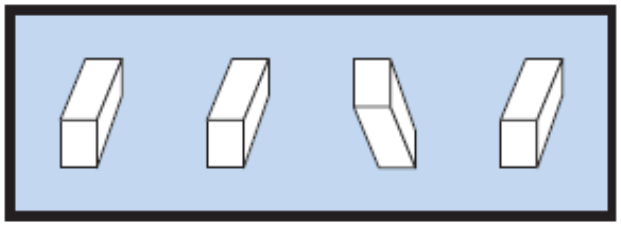
Q3: What do business professionals need to know about applications software?

Q4: Is open source software a viable alternative?

Q1: What Do Business Professionals Need To Know About Computer Hardware?

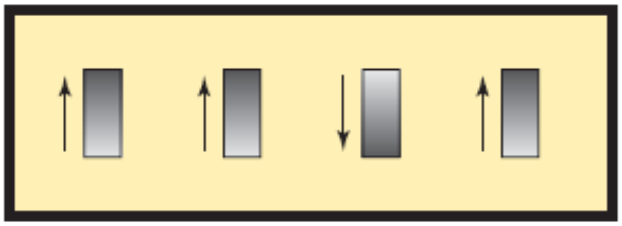


Computer Data: Binary digits (bits)



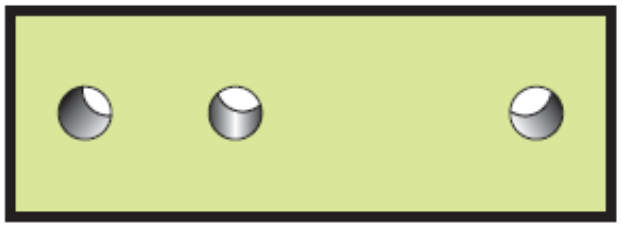
1 1 0 1

A. Light switches representing 1101



1 1 0 1

B. Direction of magnetism representing 1101



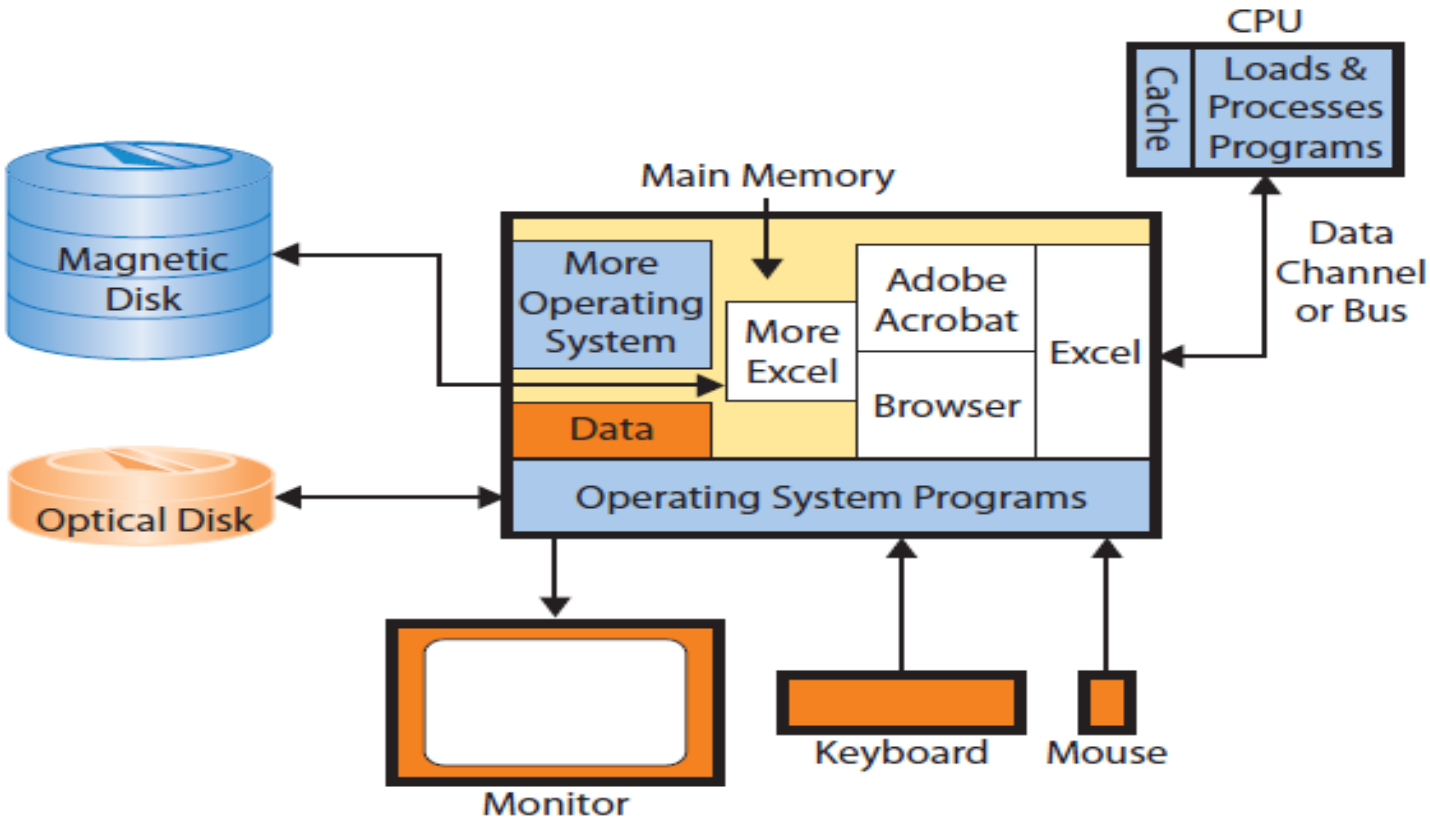
1 1 0 1

C. Reflection/no reflection representing 1101

Important Storage Capacity Terminology

Term	Definition	Abbreviation
Byte	Number of bits to represent one character	
Kilobyte	1,024 bytes	K
Megabyte	1,024 K = 1,048,576 bytes	MB
Gigabyte	1,024 MB = 1,073,741,824 bytes	GB
Terabyte	1,024 GB = 1,099,511,627,776 bytes	TB
Petabyte	1,024 TB = 1,125,899,906,842,624 bytes	PB
Exabyte	1,024 PB = 1,152,921,504,606,846,976 bytes	EB

How Does a Computer Work?



How Does a Computer Work? (cont'd)

- Main memory (RAM)
  - Program instructions
  - Operating system instructions
- Operating system (OS)
  - Controls computer's resources and blocks of data
  - Provides services to application programs and users

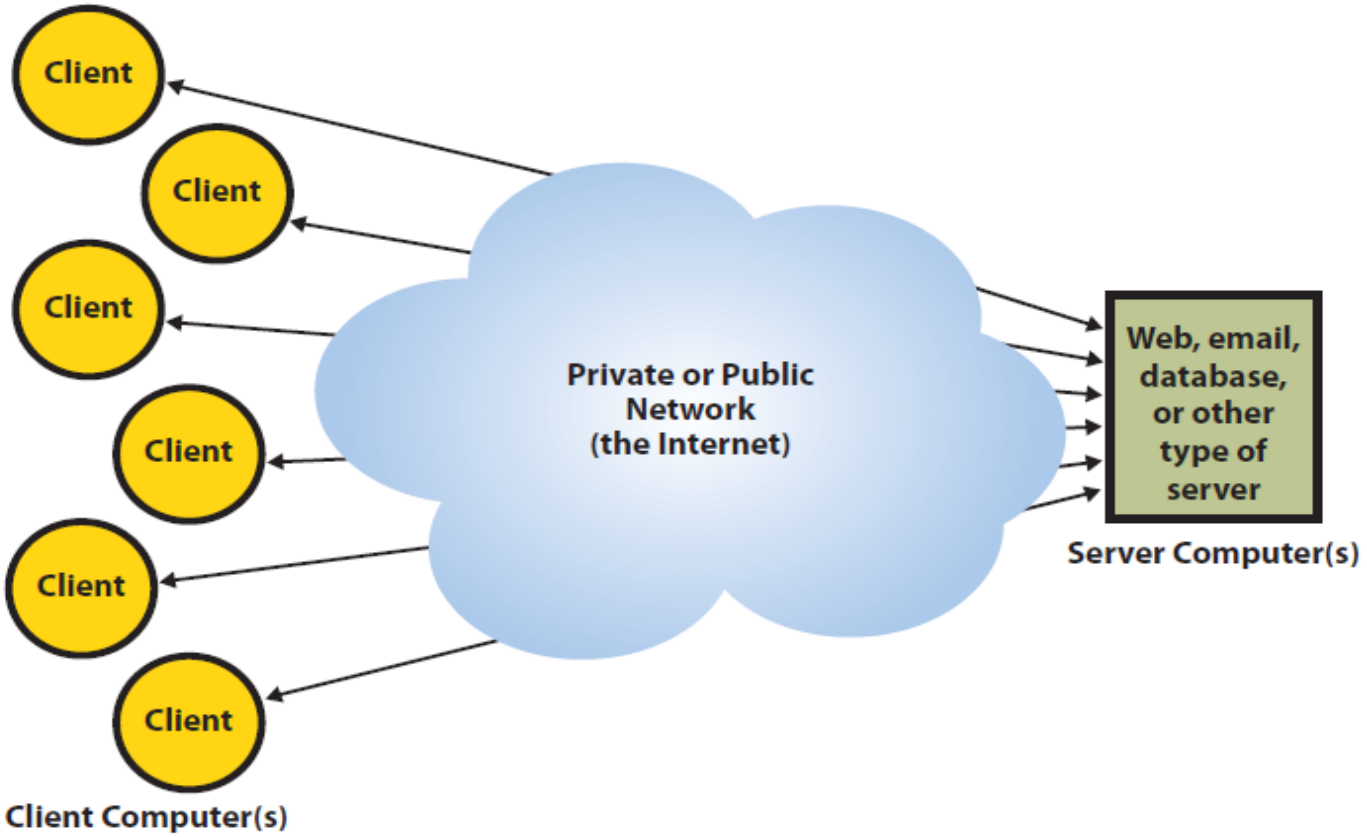
Memory Swapping

- When RAM too small to hold all open programs and data
- CPU loads new program segments into free memory
  - If none available, operating system swaps out existing instructions, or data, to a disk and copies requested program, or data, to freed space
- Swapping slows down computer

Why Does a Manager Care How a Computer Works? (cont'd)

- Simple tasks do not need fast CPU
- 64-bit dual processor, 8+GB RAM for large, complicated spreadsheets, large database files, large picture, sound, movie files
- Cache and main memory are **volatile**, so save frequently

What Is Difference Between a Client and a Server?



What Is Difference Between a Client and a Server?

	Operating System	Application Programs
Client	Programs that control the client computer's resources	Applications that are processed on client computers
Server	Programs that control the server computer's resources	Applications that are processed on server computers

Server farm

Large collection of coordinated servers

Source: Amy Walters/Shutterstock.

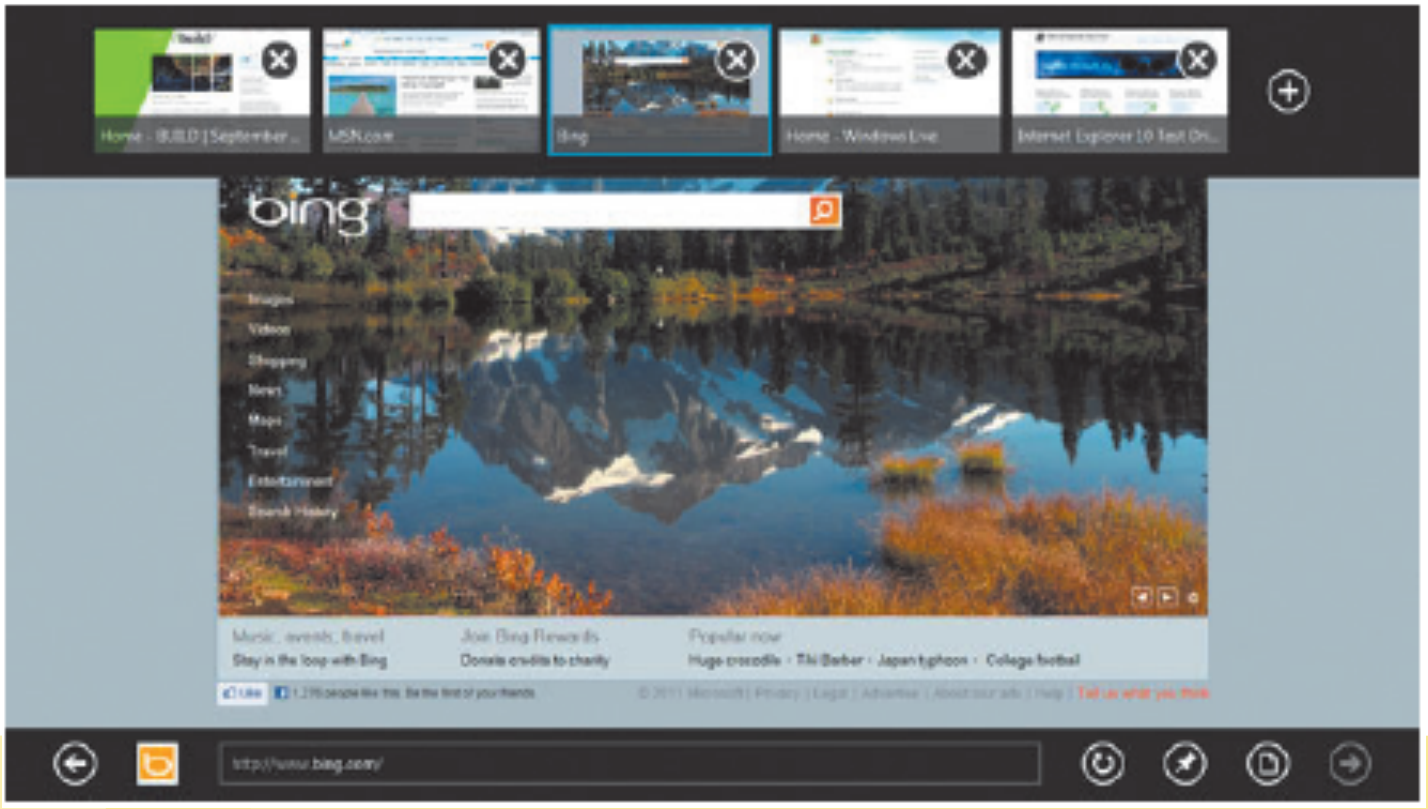
Q2: What Do Business Professionals Need To Know About Operating System Software?

- **Operating systems**
  - Run only on particular types of hardware
  - Must conform to instruction set of CPU
  - Windows works only on Intel instruction set CPUs
- **Application programs**
  - Written for a particular operating system

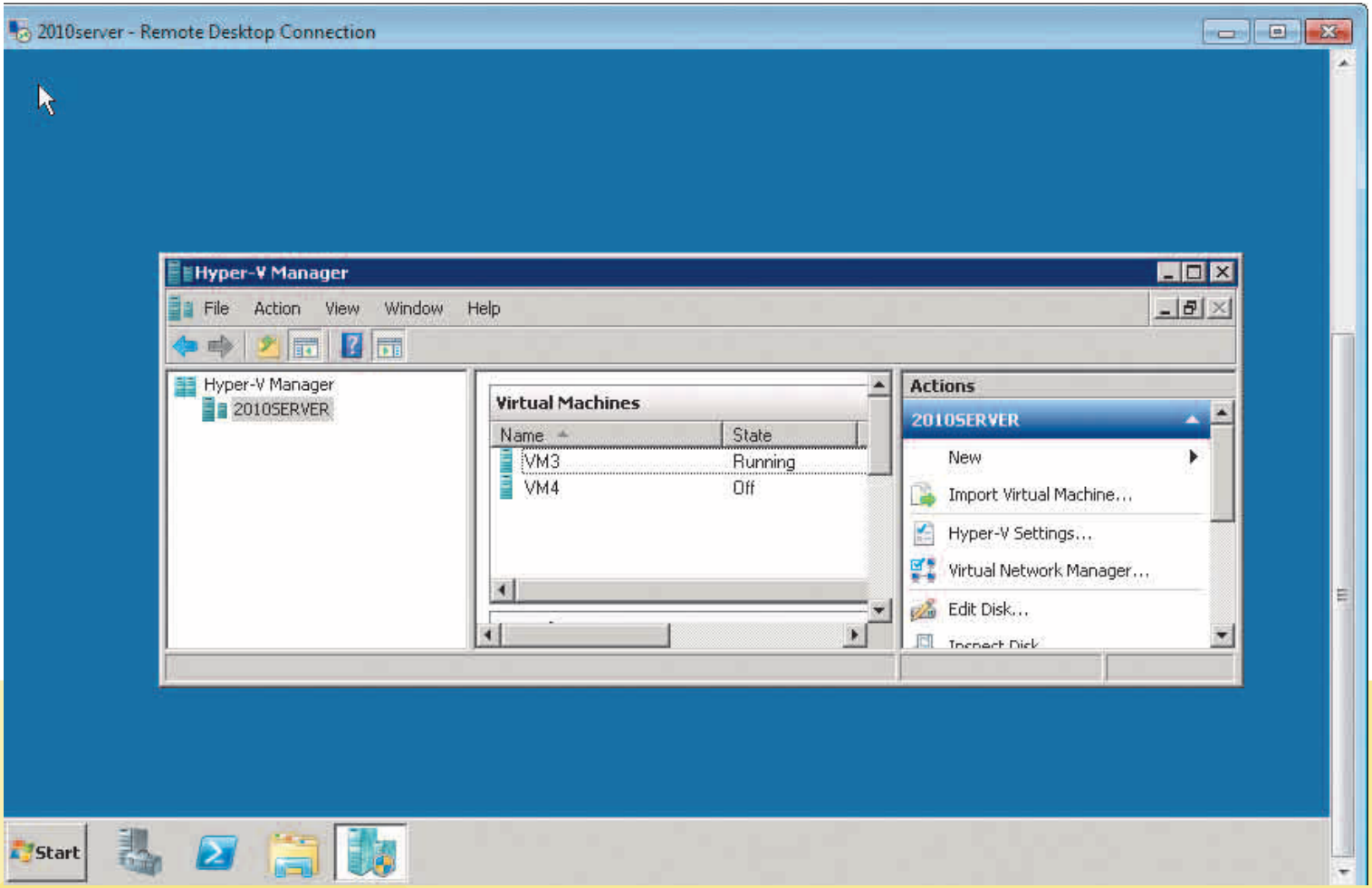
Operating Systems

Category	Operating System	Used for	Remarks
Nonmobile Clients	Windows	Personal Computer Clients	Most widely used operating system in business. Current version is Windows 8. Metro-style applications provide a touch interface.
	Mac OS X	Macintosh Clients	First used by graphic artists and others in arts community; now used more widely. First desktop OS to provide a touch interface.
	Unix	Workstation Clients	Popular on powerful client computers used in engineering, computer-assisted design, architecture. Difficult for the nontechnical user.
	Linux	Just about anything	Open-source variant of Unix. Adapted to almost every type of computing device. On a PC, used with Open Office application software.
Mobile Clients	Symbian	Nokia, Samsung, and other phones	Popular world-wide, but less so in North America.
	Blackberry OS	Research in Motion Blackberries	Device and OS developed for use by business. Very popular in beginning, but strongly challenged by iPhone and others
	iOS	iPhone, iPod Touch, iPad	Rapidly increasing installed base with success of the iPhone and iPad. Based on Max OS X.
	Android	T-Mobile and other phones. Tablets and e-readers like the Kindle Fire	Linux-based phone/tablet operating system from Google. Rapidly increasing market share.
	Windows RT	Windows 8 for ARM devices	Windows 8 tailored specifically for ARM devices, mostly tablets, but some PCs, too.
Servers	Windows Server	Servers	Businesses with a strong commitment to Microsoft.
	Unix	Servers	Fading from use. Replaced by Linux.
	Linux	Servers	Very popular. Aggressively pushed by IBM.

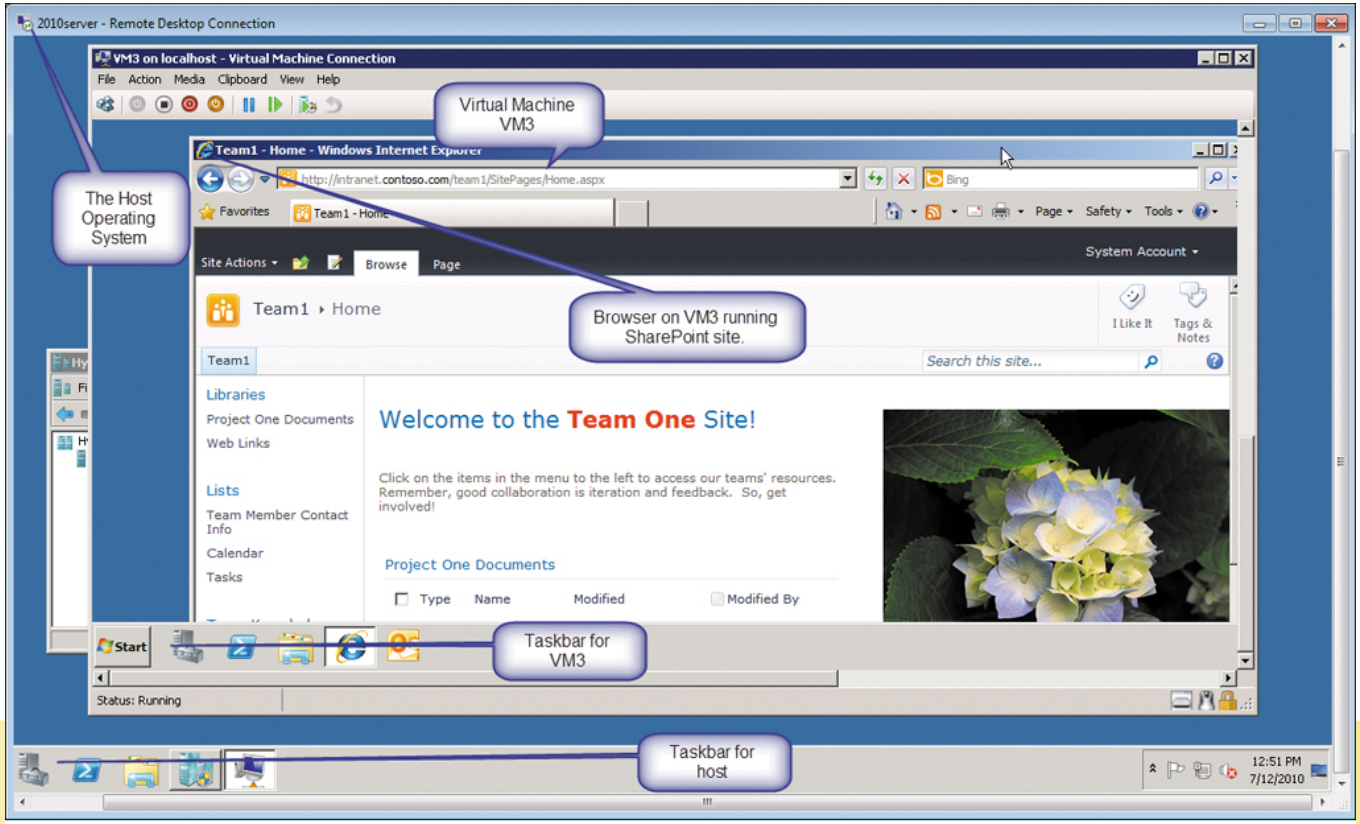
Metro Interface



Windows Server Computer Hosting Two Virtual Machines



How Virtual Machine VM3 Appears to a User



Own Versus License

- License
  - Right to use specified number of copies
  - Limits vendor's liability
- Site License
  - Flat fee to install software product on all company computers or all computers at a specific site
- Open Source
  - No license fee

Q3: What Do Business Professionals Need To Know About Applications Software?

Categories of Application Programs

- Horizontal-market applications
  - Provide capabilities common across all organizations and industries
- Vertical-market applications
  - Serve the needs of a specific industry
- One-of-a-kind applications
  - Developed for a specific, unique need

Thin vs. Thick Clients

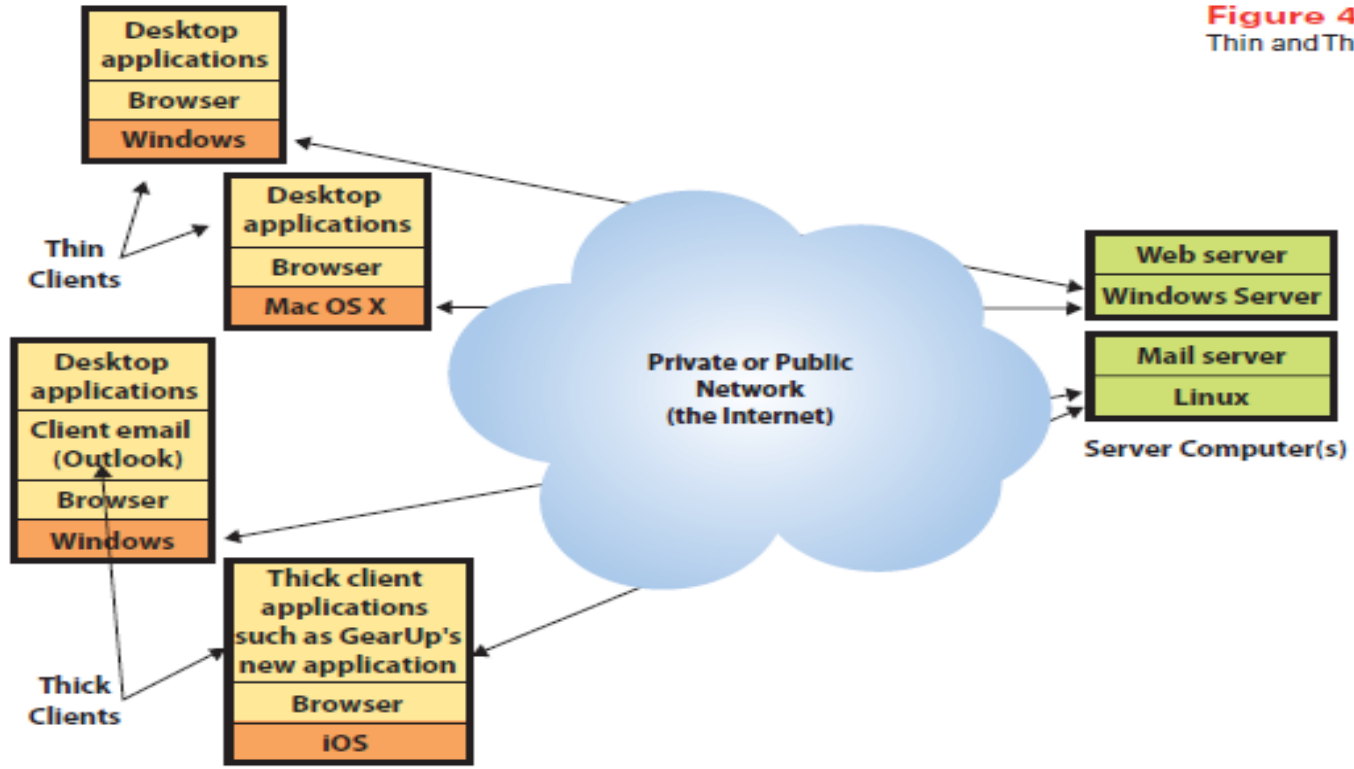
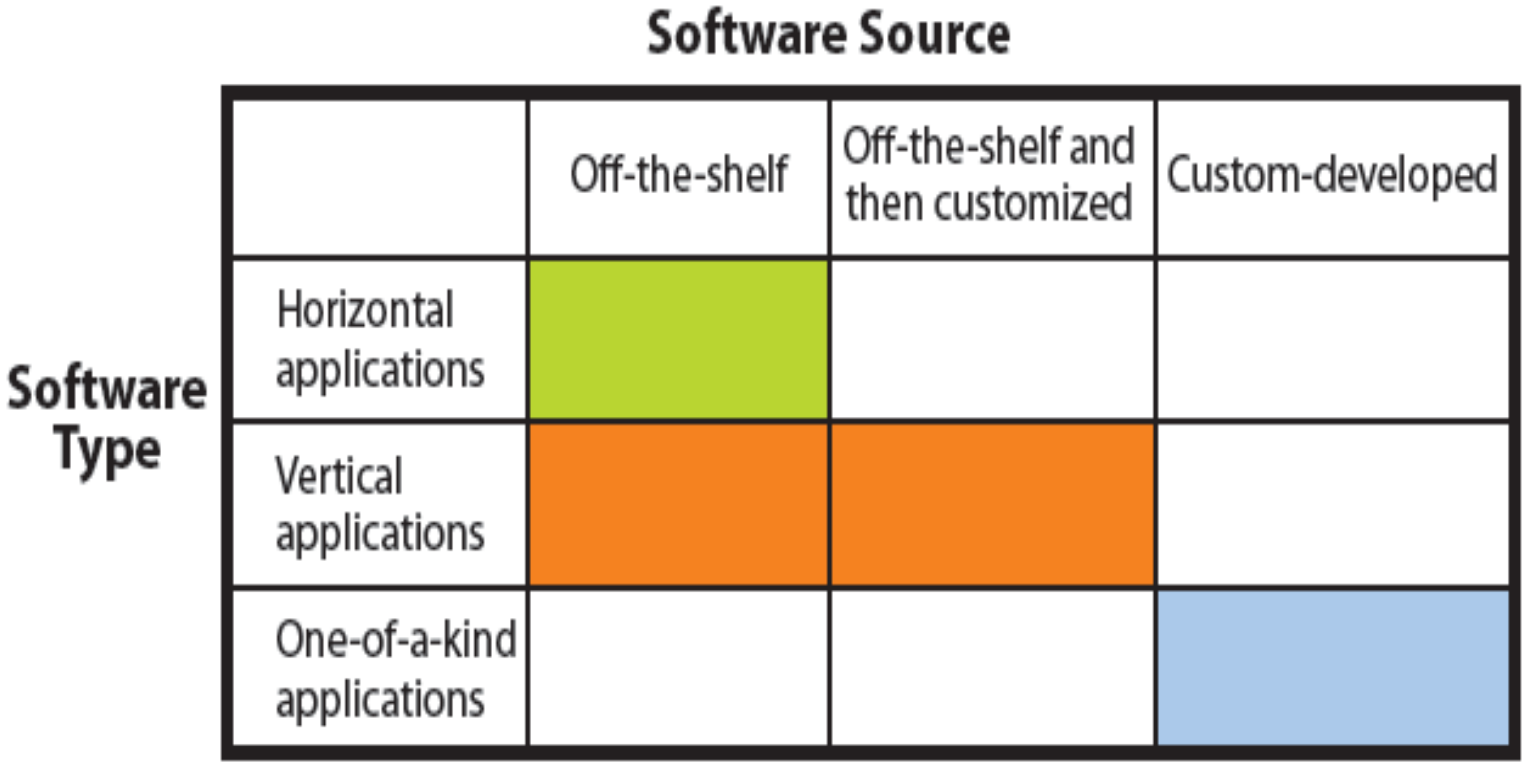


Figure 4-12
Thin and Thick Clients

Thin-client Versus Thick-client Mobile Custom Software

- **Thin client**
  - Requires nothing more than browser
  - Does not require installation and administration of client software
- **Thick client**
  - More code to run on it
  - More features and functions
  - More expense and administration

Software Sources and Types



What Is Firmware?

- Computer software installed on read-only memory
  - Printers, print servers, communication devices
  - Coded like other software
  - Can be changed and upgraded

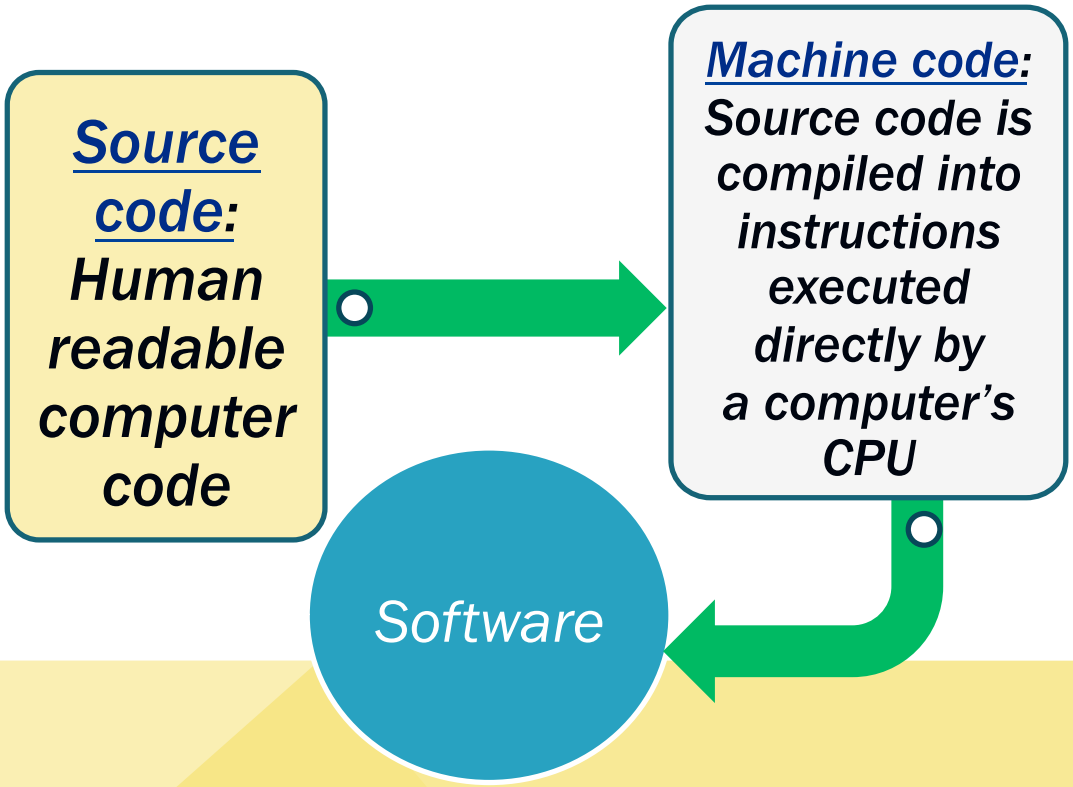
Q4: Is Open Source Software a Viable Alternative?

- **GNU general public license agreement**
- Standard for open source software
- Successful open source projects
  - Open Office (a Microsoft Office look-alike)
  - Firefox (a browser)
  - MySQL (a DBMS, see Chapter 5)
  - Apache (a Web server, see Chapter 6)
  - Ubuntu (a Windows-like desktop operating system)
  - Android (a mobile-device operating system)
  - Cassandra (a NoSQL DBMS, see Chapter 5)
  - Hadoop (a BigData processor, see Chapter 8)

Why Do Programmers Volunteer Their Services to Open Source Projects?

- It's fun
- Freedom to choose projects
- Exercise creativity on interesting and fulfilling projects
- Exhibit one's skill to get a job
- Start a business selling services

How Does Open Source Work?



Closed-source or proprietary software source code is not available to users or public. Only available to trusted employees and carefully vetted contractors.

Open-source software available to users in source code form.

Source Code Sample

```
/// <summary>
/// Allows the page to draw itself.
/// </summary>
private void OnDraw(object sender, GameTimerEventArgs e)
{
    SharedGraphicsDeviceManager.Current.GraphicsDevice.Clear(Color.CornflowerBlue);

    SharedGraphicsDeviceManager.Current.GraphicsDevice.Clear(Color.Black);

    // Render the Silverlight controls using the UIElementRenderer.
    elementRenderer.Render();

    // Draw the sprite
    spriteBatch.Begin();

    // Draw the rectangle in its new position
    for (int i = 0; i < 3; i++)
    {
        spriteBatch.Draw(texture[i], bikeSpritePosition[i], Color.White);
    }

    // Using the texture from the UIElementRenderer,

    // draw the Silverlight controls to the screen.
    spriteBatch.Draw(elementRenderer.Texture, Vector2.Zero, Color.White);

    spriteBatch.End();
}
```

So, Is Open Source Viable?

- Depends on requirements and constraints of situation
- “Free” open source software still requires support and operational costs that could cost more than a licensing fee.
- Future will involve a blend of both proprietary and open source software

How Can You Use This Knowledge?

- Know enough about hardware and software to ask good questions, and avoid embarrassing gaffs.
- Know sources of application software, and reasons for choosing one source over another.
- Know open source is a movement that creates quality software products, and a viable alternative.

Active Review

Q1: What do business professionals need to know about computer hardware?

Q2: What do business professionals need to know about operating systems software?

Q3: What do business professionals need to know about applications software?

Q4: Is open source software a viable alternative?