

Information Technology Infrastructure

- ❖ IT Infrastructure consists of the categories
 - ◆ Chapter 2 – Computer Hardware
 - ◆ Chapter 3 – Computer Software
 - ◆ Chapter 5 – Networking and Data Communication



Chapter 2 – Computer Hardware

- ❖ Computer hardware encompasses *digital* devices that can be physically touched



Digital Device = Binary Processor

- ❖ Digital data is represented and manipulated using the **binary system** = Base 2
- ❖ Each digit in binary is called a **bit**
 - ◆ A bit value can be in one of two states
 - ◆ Represented by 0/1, T/F, On/Off.
- ❖ A group of 8 bits is called a **byte** see below
 - ◆ Decimal number = 74
 - ◆ ASCII letter = 'J'
 - ◆ Gray Level = 28.9%
- ❖ A group of 16 bits is called **2 bytes** see below
 - ◆ 0011,0000,0100,0010 = 12354 decimal = ₧ unicode
 - ◆ 0101,1100,0111,0001 = 23665 decimal = ₩ unicode

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Personal Computers

- ❖ Personal Computers support a person
 - ◆ Desktop computer = Designed so all of the components fit entirely on or under a desk or table
 - ◆ Laptop (Notebook) computer = Portable computer
 - ◆ Tablet (e-Reader) computer = iPad, Kindle
 - ◆ Smart phones = iPhone, Android



Server Computers

- ❖ These computers are shared by many users
 - ◆ Servers control access to network resources and provides centralized storage
 - ◆ Web Servers serve web applications and web pages for World Wide Web using Internet
 - ◆ Mainframe Powerful, expensive computer that supports thousands of connected users
 - ◆ Supercomputer Fastest, most powerful, most expensive computer used for applications requiring complex mathematics




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Embedded Computers

- ❖ An **embedded computer** is a special-purpose computer that functions as a component in a product

Embedded Systems Types

		
ID Only RFD	Wireless Sensing Xbee	Programmable - Isolated Arduino
		
Single Board PC Part of Intel Robot Developer Kit	Embedded Linux Raspberry Pi	Programmable - Networked Arduino MKR1000, Particle, Arduino 101/TinyTile

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Memory Size and Speed

- ❖ Storage memory capacity is expressed in the **number of bytes**
 - ◆ **1 KiloByte = 2^{10}** or 1024 bytes
 - ◆ **1 MegaByte = 2^{20}** or 1,048,576 bytes
 - ◆ **1 GigaByte = 2^{30}** or 1,073,741,824 bytes
 - ◆ **1 TeraByte = 2^{40}** or 1,099,511,627,776 bytes
- ❖ **Bus speeds**
 - ◆ **1 KiloHertz = 10^3** or 1 milliSecond
 - ◆ **1 MegaHertz = 10^6** or 1 microSecond
 - ◆ **1 GigaHertz = 10^9** or 1 nanoSecond

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Inside the Case of a Desktop Computer

- ❖ Motherboard provides electrical interconnects
 - ◆ CPU = microprocessor
 - ◆ Storage devices: Hard drive, SSD, CD/DVD Drive
 - ◆ Memory
 - ◆ Ports
 - ◆ Slots

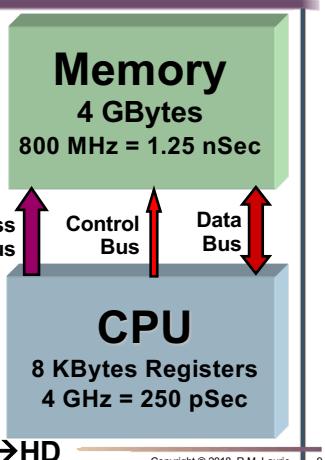


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Central Processor Unit and Memory

❖ CPU

- ◆ Register memory (fastest)
- ◆ Data transferred with memory via three buses



❖ RAM Memory

- ◆ Random-access memory
- ◆ **Volatile** memory
- ◆ Stores program instructions and data

❖ ROM Memory

- ◆ Read-only memory
- ◆ **Non-volatile** memory
- ◆ Boot program
- ◆ Usually Flash memory

❖ Speed CPU→RAM→SSD→HD

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Storage devices are Non-volatile

❖ Storage devices

- ◆ hold data, information and instructions for future use

❖ Storage media is physical material used for storage

- ◆ Magnetic: Hard drives, diskettes, credit cards, tapes
- ◆ Optical: removable media
 - ◆ CD, CD-R, CD-RW = 700 MB
 - ◆ DVD = 4.7 GB
 - ◆ Blue Ray Disk = 25 GB
- ◆ Solid State Devices:
 - ◆ USB Drives
 - ◆ SSD Drives
 - ◆ Flash memory

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Input and Output Peripheral Devices

❖ Computer's perspective determines whether Input (data) or Output (information) devices

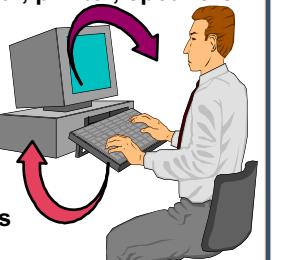
- ◆ **Input devices:** keyboard, mouse, microphone, camera, scanner, joystick, remote control
- ◆ **Output devices:** display monitor, printer, speakers

❖ Touch screens

- ◆ Provide both input and output

❖ Ports connect peripherals

- ◆ USB 2 or 3 Ports
- ◆ HDMI ports for Video
- ◆ Bluetooth is actually a wireless radio signal port



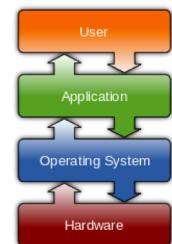
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Chapter 3 – Software

❖ Software, tells computer the tasks to perform and defines a sequence to execute the tasks

❖ Operating System

- ◆ Delivers hardware resources to user
- ◆ User interface to application software
- ◆ Provides Graphical User Interface
- ◆ Windows, MacOS, Linux, iOS, Android



❖ Applications Software

- ◆ Word Processing = Microsoft Word
- ◆ Spreadsheets = Excel
- ◆ Presentation Graphics = PowerPoint
- ◆ Database = Access
- ◆ Office Suites: Microsoft Office, LibreOffice
- ◆ Cloud based software: Google docs, zoho.com

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Functions of an Operating System

- ❖ Interfacing with Users
 - ◆ Booting the Computer
 - ◆ Loads essential part of OS into memory
- ❖ Determines hardware connected
 - ◆ Configures peripheral devices
 - ◆ Device driver software for hardware communication
 - ◆ Plug and Play devices are recognized by OS
- ❖ Provides a platform to write applications
- ❖ Managing Network Connections
 - ◆ Manages wired connections to network
 - ◆ Manages wireless connections Wifi, 3G, etc.
- ❖ File Management - Windows Explorer, MacOS finder
 - ◆ Files usually viewed in hierarchical folder (directory) structure
- ❖ Security: Passwords and Firewalls



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Unix and Linux

- ❖ UNIX: AT&T and Sun Microsystems
 - ◆ Intended for workstations and servers
- ❖ Linux
 - ◆ Developed by Linus Torvalds in 1991 grad project
 - ◆ Open-source software: usually free without support
 - ◆ <http://distrowatch.com/>
 - ◆ My favorites are: Zorin, Ubuntu Mate, Mint
 - ◆ Very powerful with bash scripting
- ❖ Strong support from mainstream companies
 - ◆ Google, Oracle, IBM, HP, and Novell
 - ◆ Android OS is a derivative of Linux
 - ◆ MacOS is a derivative of UNIX

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Utility Programs

- ❖ Software that is usually related to managing or maintaining the computer
 - ◆ Many utilities are built into operating systems
 - ◆ Control Panel accesses common utilities
 - ◆ File management program = Windows Explorer
 - ◆ Search Tools = integrated into Windows Explorer
 - ◆ Diagnostic and Disk Management Programs
 - ◆ Uninstall and Cleanup Utilities
 - ◆ File compression programs = Windows Explorer or 7-zip
 - ◆ Backup and Recovery Utilities
 - ◆ Can be stand-alone products
 - ◆ Antivirus Scanner = BitDefender, AVG and Avast
 - ◆ Spyware Scanner = Spybot Search and Destroy

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Application Software

- ❖ How is software distributed?
 - ◆ **Commercial software**, mass-produced for purchase
 - ◆ Microsoft Office
 - ◆ **Custom software**, performs functions specific to a business or industry
 - ◆ **Web app software**, hosted by a Web site
 - ◆ Google Drive, Zoho, and Microsoft Office 365
 - ◆ **Open source software**, provided for use, modification, and redistribution
 - ◆ www.OpenOffice.org www.LibreOffice.org
 - ◆ **Shareware**, copyrighted software that is distributed free for trial period
 - ◆ **Freeware**, copyrighted software provided at no cost
 - ◆ **Public-domain software**, freeware with no copyright restrictions

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Office Suite Software

- ❖ Programs designed to make users more productive and assist them with tasks
- ❖ Microsoft Office = packaged software
 - ◆ Core applications: Word, Excel, PowerPoint, Access
 - ◆ Personal Information Manager – Outlook

FILE TAB
Contains common document commands, such as Save and Print.

QUICK ACCESS TOOLBAR
Contains command buttons for frequently used commands; can be modified by the user.

TABS
Organize related groups of commands; the Home tab is currently selected.

GALLERY
Displays sets of options that can be selected for a particular feature; this is the Styles gallery.

COMMAND BUTTONS
Issue a command or display a list of related commands.

GROUPS
Related commands on the Ribbon are organized into groups; these are the Font and Paragraph groups.

DIALOG BOX LAUNCHER
Opens a dialog box or task pane for that group.

MORE BUTTON
Opens a gallery to display more options.

HELP BUTTON
Launches the Office Help system.

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Spreadsheet

- ❖ Spreadsheet software allows users to organize data, perform calculations, and chart data as graphic

NAME BOX
Identifies the active cell, which is the location of the cell pointer.

COLUMNS
Run vertically and are identified by letters.

FORMULA BAR
Lists the contents of the active cell, in this case the formula entered into cell E8.

NUMBER FORMATS
Used to specify the appearance of the numbers on a worksheet.

RIBBON
Contains tabs of commands grouped by function; the Home tab is selected.

ACTIVE CELL/RANGE
Identifies the active cell or range; in this case the active cell is E8, and the range D8:E9 is selected.

ROWS
Run horizontally and are identified by numbers.

WORKSHEET AREA
Contains the worksheet itself.

GRAPHS
Are typically based on worksheet data and can be inserted into the worksheet area.

WORKSHEET TABS
Identify the different worksheets saved in a single spreadsheet (workbook) file.

CELL FORMATTING
Can be applied to cells (this cell is shaded blue with a double bottom border) and to cell content (such as currency with two decimal places).

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Applications for the Enterprise

- ❖ Enterprise Resource Planning (ERP)
 - ◆ ERP is software applications that utilize a central database for the entire organization
 - ◆ Enforce best practices
 - ◆ Supply Chain Management (SCM) module included
 - ◆ Can take 2 – 3 years to implement and lots of \$\$\$
- ❖ Supply Chain Management (SCM)
 - ◆ Inventory control, supplier links, distributor links
- ❖ Customer Relations Management (CRM)
 - ◆ Create relationships with customers
 - ◆ Salesforce is the current leader
 - ◆ UMUC chose Salesforce

Microsoft Dynamics AX
SAP ORACLE

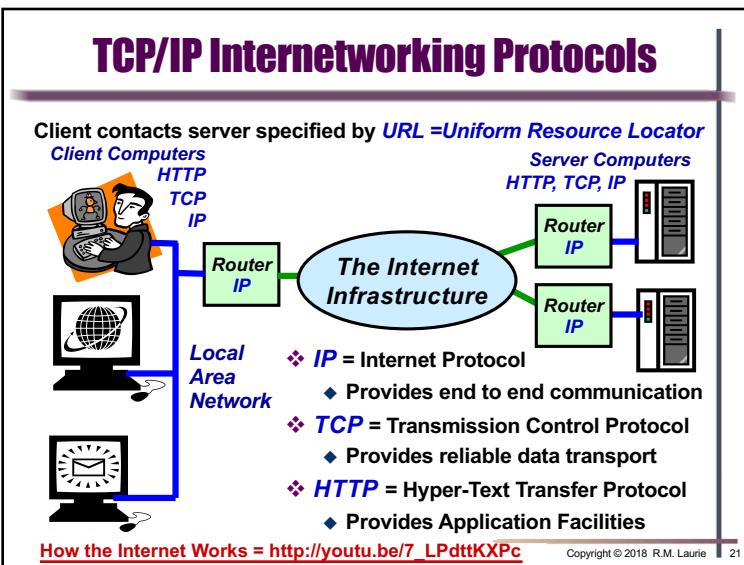
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Chapter 5 – Networking

- ❖ A **Network** is a collection of computers and devices connected together via transmission media
- ❖ **Ethernet** is standard protocol used for LAN=Local Area Network (Wired)
- ❖ **Wi-Fi** is a wireless LAN using radio
- ❖ **Mobile Networks: 3G, 4G, WiMax**
- ❖ **Internet** is a worldwide collection of interconnecting networks that connects millions of worldwide
- ❖ **Intranet** is only accessible within corporate networks
- ❖ **Extranet** connects with suppliers, partners, and customers

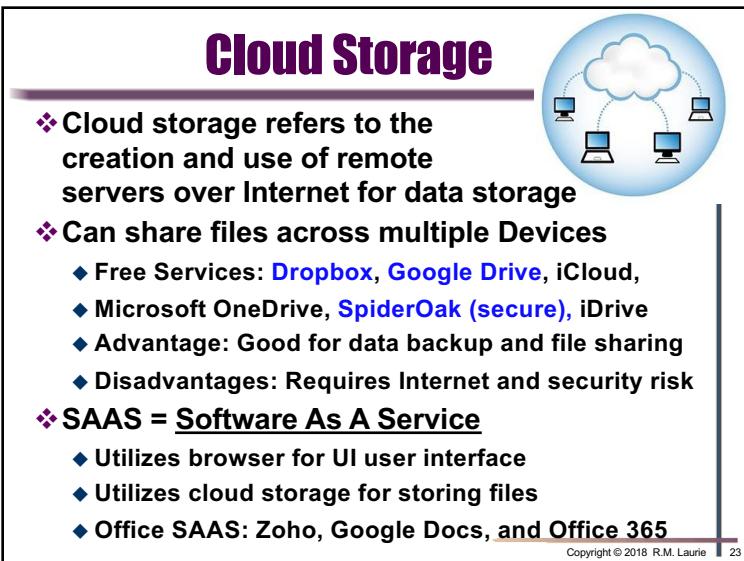
INTERNET
EXTRANET
INTRANET
LAN
employees
partners
public

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Accessing the World Wide Web

- ❖ The World Wide Web utilizes the Internet
 - ❖ HTTP (Hyper Text Transfer Protocol) accesses web sites files located on the web server
 - ❖ Each web site has URL (Uniform Resource Locator)
 - ◆ <http://www.islandman.org> .edu (education)
 - ◆ <http://www.umuc.edu> .com (commercial)
 - ◆ <http://mail.yahoo.com> .gov (government)
 - ◆ <http://www.whois.ws> .org (non-profit)
 - ❖ Domain Name Server matches URL with IP address
 - ◆ www.nmcnet.edu → 12.178.198.111 (Octet <= 255)
 - ◆ www.whois.ws → 69.25.212.161
- <http://www.umuc.edu/cs/courses/index.html>
- Protocol Server Domain TLD Folder Path File
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Chapter 8: Business Processes

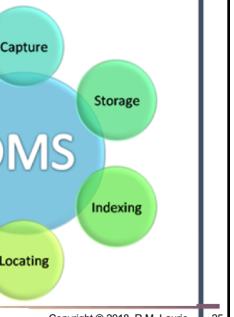
- ❖ Process is a series of tasks that are completed in order to accomplish a goal
 - ❖ **Business process** is focused on achieving a goal for a business
 - ◆ Subway: Making sandwich
 - ◆ [Supply Chain Management](#)
 - ◆ UMUC: Receiving student tuition payment
 - ❖ Documenting a Process
 - ◆ Verbal Step-by-step
 - ◆ Flowcharts work well
-
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DMS = Document Management System

- ❖ Document Management System stores and tracks documents

- ◆ Versions control with change details
- ◆ Approvals authorization routing
- ◆ Audit trail Timestamps
- ◆ Change notification
- ◆ Keyword indexing
- ◆ Storage on server
- ◆ Access Control
- ◆ Retrieval from server
- ◆ Capture Image and text

- ❖ Document **Business Processes**



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Enterprise Applications

- ❖ **Enterprise Systems**

- ◆ Aka enterprise resource planning (ERP) systems
- ◆ Suite of integrated software modules and a common database
- ◆ Collects data from many divisions of firm for use in nearly all of firm's internal business activities
- ◆ Information entered in one process is immediately available for other processes

- ❖ Enterprise software has 1000s of predefined modules reflecting best practices for Business Processes

- ◆ Finance/accounting: General ledger, accounts payable, etc.
- ◆ Human resources: Personnel administration, payroll, etc.
- ◆ Manufacturing/production: Purchasing, shipping, etc.
- ◆ Sales/marketing: Order processing, billing, sales planning, etc.

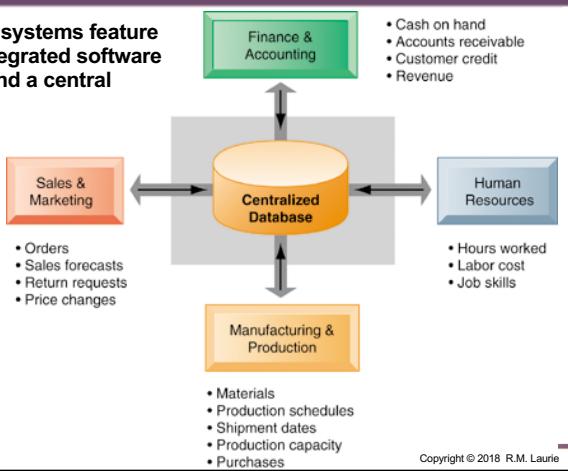
- ❖ Firm select modules for implementation

- ❖ Maps business processes to software processes

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How ERP Systems Work

Enterprise systems feature a set of integrated software modules and a central database



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Enterprise Resource Planning System

- ❖ ERP is a centralized database application

- ◆ Can be used to run an entire corporate enterprise
- ◆ Shares information across between all entities

- ❖ Implements the rules of all associated Business Processes

- ◆ Best for structured processes
- ◆ Best practices built in!
- ◆ Existing process replaced
- ◆ Is ERP process better?
- ◆ Loss of differentiation
- ◆ Not well suited for unstructured Business processes



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Business Value of Enterprise Systems

- ❖ Increase operational efficiency
- ❖ Provide firmwide information to support decision making
- ❖ Enable rapid responses to customer requests for information or products
- ❖ Include analytical tools to evaluate overall organizational performance



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Business Process Management

- ❖ Intentional effort to plan, document, implement, and distribute an organization's business processes with IT
- ❖ Best processes to manage:
 - ◆ Include employees from multiple departments
 - ◆ Require decisions that cannot be easily automated
 - ◆ Processes that change based on circumstances
- ❖ Key Benefits of **BPM**:
 - ◆ Empowering Employees to make limited decisions
 - ◆ Built-in reporting provides feedback to organization
 - ◆ Enforces Best Practices and Consistency for a process

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Business Process Reengineering

- ❖ Automating a bad process doesn't improve it
- ❖ Develop new processes that take advantage of new technologies and concepts
- ❖ **BPR** is fully understanding goals of a process and redesigning it to improve productivity and quality
 - ◆ Organize around outcomes, not tasks
 - ◆ Instead of repeating one step in the process over and over, the person stays involved in the process from start to end
 - ◆ When one department of organization creates information it should be processed by that same department
 - ◆ Centralize geographically dispersed resources (IT, HR, Billing)
 - ◆ Link parallel activities instead of integrating their results
 - ◆ Decisions points in workflow and build controls into process
 - ◆ Avoid data redundancy, capture data once, at the source

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IT's Six Strategic Business Objectives

1. Operational excellence:
 - ◆ Improvement of efficiency to improve profitability
 - ◆ *Walmart's RetailLink* links suppliers to stores
2. New products, services, and business models:
 - ◆ Enabling tool for new products and services
Example: Apple's iPod, iTunes, iPhone, iPad
 - ◆ **Business model**: describes how company produces, delivers, and sells to create wealth
3. Customer and supplier intimacy:
 - ◆ Serving customers well leads to customers returning, which raises revenues and profits
 - ◆ Example: High-end hotels use computers to track customer preferences and customize environment
 - ◆ Intimacy with suppliers allows them to provide vital inputs *Just-In-Time*, which lowers costs

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IT's Six Strategic Business Objectives

4. Improved decision making with DSS
 - ◆ Without accurate information managers must use forecasts, best guesses, luck
 - ◆ Leads to overproduction and underproduction of goods
 - ◆ Poor response times, raise costs, lose customers
5. Competitive advantage
 - ◆ Delivering better performance
 - ◆ Charging less for superior products
 - ◆ Rapid response to customers and suppliers
6. Survival
 - ◆ Industry-level changes example: ATM's and ACH
 - ◆ Governmental regulations requirements examples
 - ◆ Toxic Substances Control Act – 30 year records
 - ◆ Sarbanes-Oxley Act – 5 year accounting records for audit

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Videos to View

1. Supply Chain? <https://youtu.be/Mi1QBxVjZAw>
2. Business Processes <https://youtu.be/JUInjQvzIkE>
3. Document MS <https://youtu.be/-1udkX8VCTc>
4. ERP <https://youtu.be/6qys-562kp4>
5. BPM <https://youtu.be/iI6T3-7JxdU>
6. BPR <https://youtu.be/ee8iGNfem50>

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