CARL VON OSSIETZKY universität OLDENBURG
FAKULTÄT II
INFORMATIK, WIRTSCHAFTS- UND RECHTSWISSENSCHAFTEN

TEMPUS PROJECT MSC.ESE
530260-TEMPUS-1-2012-1-DE-TEMPUS-JPCR

Introduction to Cloud Computing

Cloud Computing and Big Data

Tempus

M.Sc. ese
EXPORTING MASTER PROGRAM IN
ENTERPRISE SYSTEMS ENGINEERING
TO JORDAN, SYRIA, TUNISIA AND EGYPT

EMC² where information lives

MODULE – 2

CLASSIC DATA CENTER

Module 2: Classic Data Center (CDC)

Upon completion of this module, you should be able to:

- Describe the key elements of a CDC (compute, storage, and network)
- Describe the common storage networking technologies in a CDC
- Explain business continuity technologies commonly used in a CDC
- Discuss CDC management

Module 2: Classic Data Center (CDC)

Lesson 1: Application, DBMS, Compute, and Storage

Topics covered in this lesson:

- Application and DBMS
- Physical and logical components of a compute system
- Storage device options
- RAID technology and Intelligent storage system

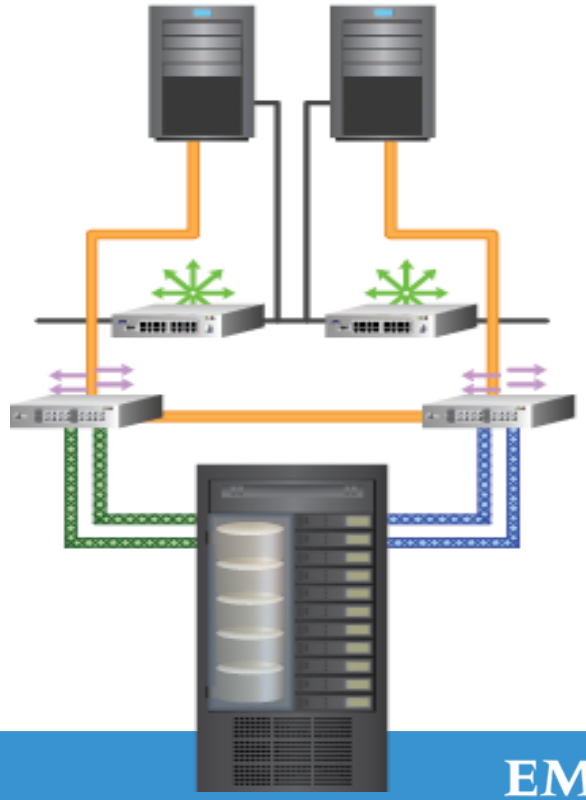
Classic Data Center (CDC)

CDC

A CDC is a facility containing physical IT resources including compute, network, and storage

Core elements of CDC
Application
Database Management System (DBMS)
Compute
Storage
Network

Classic Data Center



Key Requirements of a Data Center

Application

- Commonly deployed applications in a CDC
  - Business applications
    - E-mail, Enterprise Resource Planning (ERP), Decision Support System (DSS), Data Warehouse (DW)
  - Management applications
    - Resource management, performance tuning
  - Data protection applications
    - Backup, replication
  - Security applications
    - Authentication, antivirus
- Key I/O characteristics of an application
  - Read intensive vs. write intensive
  - Sequential vs. random

Database Management System (DBMS)

- Database is a structured way to store data in logically organized tables that are interrelated
  - Helps to optimize the storage and retrieval of data
- DBMS is a collection of computer programs that control the creation, maintenance, and use of databases
  - Processes an application's request for data
  - Instructs the OS to retrieve the appropriate data from storage
- Popular DBMS examples are MySQL, Oracle RDBMS, SQL Server, etc.

Compute

Compute

A resource that runs applications with the help of underlying computing components

- Compute consists of physical components (hardware devices) and logical components (software and protocols)
- Physical components of compute are CPU, Memory, and Input/Output (I/O) devices
- I/O devices facilitate the following types of communication:
  - User to compute: Handled by basic I/O devices such as keyboard, mouse, etc.
  - Compute to compute/storage: Enabled using host controller or host adapter

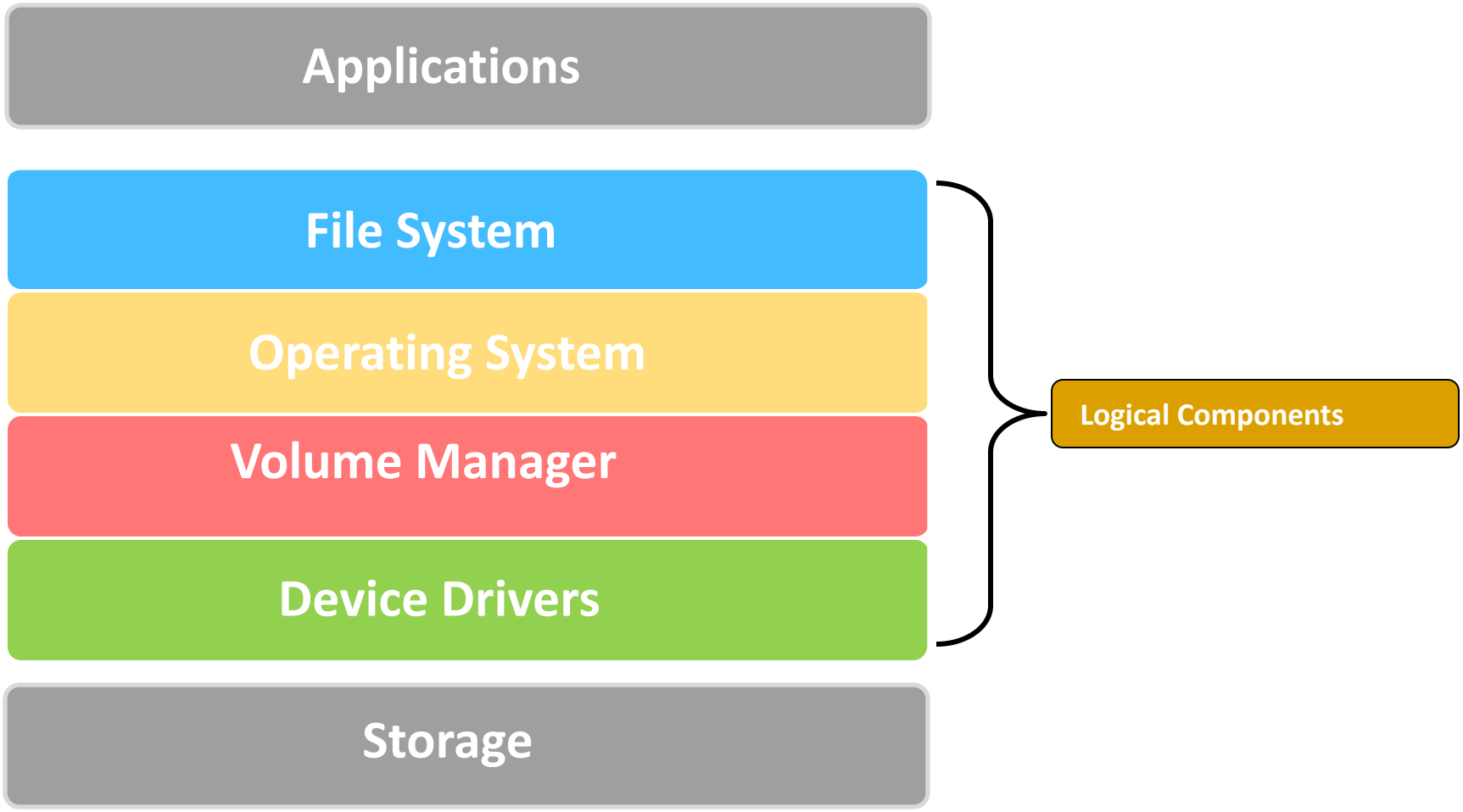
Examples of Compute System

- Examples of compute systems:
  - Laptops/Desktops
  - Blade servers
  - Complex cluster of servers
  - Mainframes
- Bladed server technology is commonly used to deploy compute systems in a CDC
  - Consolidates power- and system-level function into a single, integrated chassis
  - Enables the addition of server modules as hot-pluggable components
  - Provides increased server performance and availability without increase in size, cost, or complexity

Server Clustering

- Multiple servers (nodes) are brought together in a cluster to improve availability and performance
  - When a failure occurs on one node in a cluster, resources and workload are redirected to another node
- Exchange heartbeat is a checkup mechanism between two nodes
  - To see whether a node is up and running
  - A failover is initiated, if heartbeat fails

Logical Components of Compute



Storage

Storage

It is a resource that stores data persistently for subsequent use.

- Data created by individuals/businesses must be stored for further processing
- The type of storage device used is based on the type of data and the rate at which it is created and used
- A storage device may use magnetic, optical, or solid state media
  - Examples: Disk drive (magnetic), CD (optical), Flash drive (solid state)

Storage Device Options

Tape Drive	• Low cost solution for long term data storage • Sequential data access, physical wear and tear, and storage/retrieval overheads
Optical Disk	• Write Once and Read Many (WORM): CD, DVD • Limited in capacity and speed • Popular in small, single-user environments
Disk Drive	• Random read/write access • Uses mechanical parts for data access • Most popular storage device with large storage capacity
Solid State Drive	• Provides ultra high performance required by mission-critical applications • Very low latency per I/O, low power requirements, and very high throughput per drive

Redundant Array of Independent Disks (RAID)

RAID

A technology which utilizes multiple disk drives as a set to provide protection, capacity, and/or performance benefits

- Overcomes limitations of disk drives
- Improves storage system performance
  - By serving I/Os from multiple disks simultaneously
- RAID techniques are:
  - Striping, mirroring, and parity