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CS 446 Homework 3

Chapter 5

Question 1:

RAID: Redundant Array of Independent Disks.

Read performance:

RAID 0: It uses two drives for data storage, while drives are striped. Every read request, parallel and simultaneous, is carried out on both the drives. Read operation is done concurrently. Read operations' throughput to any given file is proportional or multiplied by the disk numbers.

RAID 1: Double RAID 0’s read operation rate. Finished carrying out data mirroring technique, placing or copying the exact same data in multiple disks, thus allowing two read requests for the same data. It could provide a sustained read throughput. It allows two read requests to be carried at the same time.

RAID 0, 2, 3, 4, and 5: all of these RAID types allow parallel reads for one read request.

RAID 5: There is an increase in the read speed. Good for sequential reads.

Write performance:

The write performance is equivalent to the read performances of all RAID levels.

Space overhead:

RAID 0: no space overhead.
RAID 1: 100% space overhead.
RAID 2: 18.75% space overhead due to its six parity drives and 32-bit data word.
RAID 3: 3.13% space overhead for a 32-bit data word.
RAID 4: 3.13% space overhead, with an assumption of 33 drives in it.
RAID 5: 3.13% space overhead, with an assumption of 33 drives in it.

Reliability:

RAID 0: zero reliability is provided as there is no provision of backup in it.

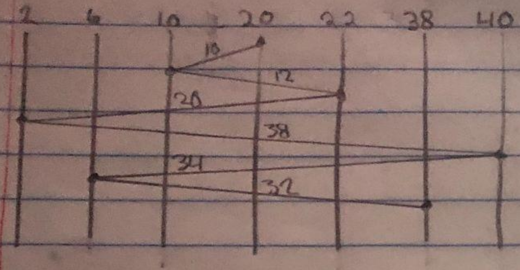
RAID 1, 2: in both RAIDs mirroring is done, with or without striping, so there is a copy of data saved. Therefore, they can survive at least one disk crash.

RAID 3, 4, and 5: like RAID 1 and 2, RAID 3, 4, and 5 can survive the crash of one disk. They also have parity bit(s), therefore they can detect a single random bit error in a word.

Question 2:

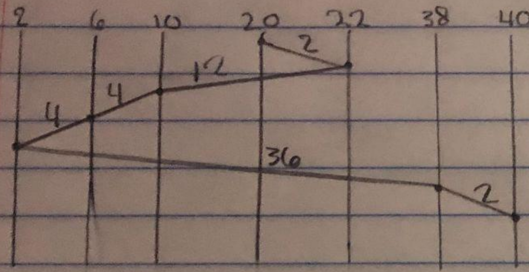
Chapter 5: Question 2

a. <u>first-come, first-serve:</u>



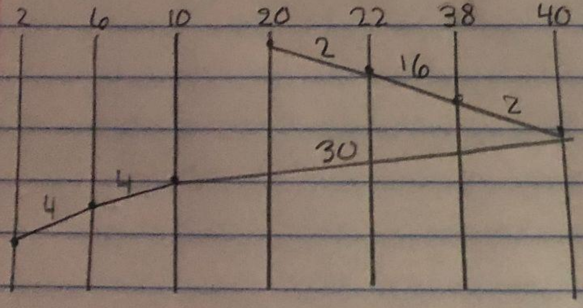
Total head movement:
$= 10+12+20+38+34+32 = 146$
Total seek time $= 146 \times 6$
$= 876$ msec

b. closest cylinder next:



Total head movement:
$= 2+12+4+4+36+2 = 60$
Total seek time $= 60 \times 6$
$= 360$ msec

c. elevator algorithm (initially moving upward):



Total head movement:
$= 2+16+2+30+4+4 = 58$
Total seek time $= 58 \times 6$
$= 348$ msec

Chapter 8

Question 3:

The types of middleware include database middleware, message-oriented middleware, and transaction-processing monitors.

So if access to a database is a top priority for a particular company, then database middleware is the way to go. However, it's more likely that the company will use database software with other types of middleware. Database middleware only enables applications to communicate with one or more local or remote databases. It doesn't transfer calls or objects. And while database-oriented middleware is easy to deploy and relatively inexpensive, it doesn't include features found in more complex software products. Database middleware, for example, doesn't allow for two-way communication between servers and clients. Servers can't initiate contact with clients, they can only respond when asked.

Messaging-oriented middleware provides an interface between client and server applications, allowing them to send data back and forth intermittently. Messaging middleware is similar to an e-mail system, except that it sends data between applications. If the target computer isn't available, the middleware stores the data in a message queue until the machine becomes available.

A transaction-processing monitor is middleware technology that sits between a requesting client program and databases, ensuring that all databases are updated properly. It's a control program that manages the transfer of data between multiple terminals and the application programs that serve them.

Question 4:

Differences between APIs and middleware:

API is an Application Programmer Interface. It is a term that refers to the methods a programmer will use to interface with the software. A framework implements an API. The API isolates framework clients from the implementation details of the underlying framework.

Middleware is software that allows a bunch of isolated systems or functionalities to interact. Middleware is typically a framework specialized for interprocess communications. Middlewar supplies more than just the basic library, it also supplies associated tools like logging, debugging and performance measurement.

Question 5:

Three different data formats for APIs are JSON, XML and YAML

Chapter 7

Question 6:

Type two hypervisors work on top of the operating system. Docker, on the other hand, works on the host kernel itself.

Question 7:

IaaS: Infrastructure as a service

Cloud infrastructure services, known as Infrastructure as a Service (IaaS), are made up of highly sophisticated and automated hardware. IaaS is fully self-sufficient in accessing and monitoring computers, networks, storage, and other resources. IaaS allows businesses to purchase resources when needed and as needed instead of buying hardware directly.

IaaS delivers cloud computing infrastructure, including servers, network, operating systems, and storage, through visual technology. These cloud servers are typically provided to the organization via a dashboard or API, giving IaaS clients complete control over all infrastructure. IaaS provides the same technology and power as a standard data center without physically caring for or managing it all. IaaS clients may still be able to access their servers and storage directly, but all are deployed through a "visible data center" in the cloud.

Unlike SaaS or PaaS, IaaS clients are responsible for managing features such as applications, operating time, OS, middleware, and data. However, IaaS providers manage servers, hard drives, networks, virtualization, and storage. Some providers even offer multiple services beyond the virtualization layer, such as websites or message lines.

IaaS benefits:
The most flexible computer model
It is easy to automate the deployment of storage, network, servers, and processing capacity
Purchase of hardware may be based on usage
Clients maintain complete control of their infrastructure
Resources can be purchased as needed
Very scalable
IaaS features
Features that define IaaS include:
Resources are available as a service
Costs vary depending on usage
Services can be very measurable
Multiple users in one piece of hardware
The organization maintains complete control of the infrastructure
It is powerful and flexible

Examples of IaaS:
DigitalOcean
Linode
Rackspace
Amazon Web Services (AWS)
Cisco Metacloud
Microsoft Azure
Google Compute Engine (GCE)

PaaS: A platform as a service

Cloud platform services, also known as Platform as a service (PaaS), provide cloud components to specific software while being widely used by applications. PaaS brings a framework for developers that they can build on and use to create custom applications. All servers, storage, and network can be managed by a business or third-party provider while developers are unable to maintain application management.

The PaaS delivery model is similar to SaaS, except that instead of delivering software over the Internet, PaaS provides a platform for software creation. This forum is web-based, giving developers the freedom to focus on software development without having to worry about operating systems, software updates, storage, or infrastructure.

PaaS allows businesses to design and create PaaS-based applications with specialized software components. These applications, sometimes called middleware, are highly scalable and highly accessible as they capture some of the features of the cloud.

PaaS benefits:
Easy development, saving and deployment of applications
Scalable
It is widely available
Engineers can customize apps without the pain of having to take care of software
Significant reduction in coding value required
Business policy automation
Easy to move to hybrid model
PaaS features
PaaS has many features that it defines as a cloud service, including:
Build on virtualization technology, so resources can be easily expanded or depleted as your business evolves
Provides a variety of services to assist with the development, testing, and distribution of applications
Available to multiple users with the same development app
Includes web services and websites.

Examples of PaaS:
AWS Elastic Beanstalk
Windows Windows
Heroku
Force.com
Google App Engine
OpenShift

SaaS: Software as a service:
Software as a service, also known as cloud application services, represents the most commonly used option for cloud market businesses. SaaS uses the Internet to deliver applications, run by a third party vendor, to its users. Most SaaS applications work directly in your web browser, which means they do not need to be downloaded or installed on the client side.

Thanks to the web delivery model, SaaS eliminates the need for IT staff to download and install applications on each computer. With SaaS, vendors manage all possible technical issues, such as data, middleware, servers, and storage, leading to systematic maintenance and business support.

SaaS offers many benefits to employees and companies by significantly reducing the time and money spent on tedious tasks such as installing, managing, and developing software. This frees up a lot of time for technical staff to use it on stressful issues and issues within the organization.

SaaS benefits:
Held in the middle
Hosted on remote server
It is accessible online
Users are not responsible for hardware or software updates.

Examples of SaaS:
Google Workspace (formerly known as GSuite)
Dropbox
Salesforce
Cisco WebEx
SAP is compatible
GoToMeeting

By using cloud services such as IaaS, PaaS, and SaaS, businesses can improve productivity and efficiency without sacrificing budget or losing important data.