

Q.1. Describe LRU cache in brief?

Ans: -

LRU (Least Recently Used) Cache discards the least recently used items first. This algorithm requires keeping track of what was used when, which is expensive if one wants to make sure the algorithm always discards the least recently used item. General implementations of this technique require keeping “age bits” for cache-lines and track the “Least Recently Used” cache-line based on age-bits. The LRU caching scheme is to remove the least recently used frame when the cache is full and a new page is referenced which is not there in the cache. There are generally two terms use with LRU Cache.

Page hit: If the required page is found in the main memory, then it is a page hit.

Page Fault: If the required page is not found in the main memory, then page fault occurs. When a page is referenced, the required page may be in the memory. If it is in the memory, we need to detach the node of the list and bring it to the front of the queue. If the required page is not in memory, we bring that in memory. In simple words, we add a new node to the front of the queue and update the corresponding node address in the hash. If the queue is full, i.e., all the frames are full, we remove a node from the rear of the queue, and add the new node to the front of the queue.

Q.2. What happens when you type www.attainu.com in your browser?

Ans: -

You enter the URL in the browser.

Suppose you want to visit the website of www.attainu.com. So, you type attainu.com in the address bar of your browser.

When you type any URL, you basically want to reach the server where the website is hosted.

2. The browser looks for the IP address of the domain name in the DNS (Domain Name Server).

DNS is a list of URLs and their corresponding IP address just like the telephone book has phone numbers. corresponding to the names of the people.

We can access the website directly by typing the IP address but imagine remembering a group of numbers to visit any website.

So, we only remember the name of the website and the mapping of the name with the IP address is done by the DNS.

> The DNS checks at the following places for the IP address: -

1.> Check Browser Cache:

The browser maintains a cache of the DNS records for some fixed amount of time.

It is the first place to run a DNS query.

2.> Check OS Cache:

If the browser doesn't contain the cache, then it requests to the underlying Operating System as the OS also maintains a cache of the DNS records.

Q.3. What is NAT and ARP? Describe briefly?

Ans: - NAT -

Network Address Translation (NAT) is designed for IP address conservation. It enables private IP networks that use unregistered IP addresses to connect to the Internet. NAT operates on a router, usually connecting two networks together, and translates the private (not globally unique) addresses in the internal network into legal addresses, before packets are forwarded to another network.

As part of this capability, NAT can be configured to advertise only one address for the entire network to the outside world. This provides additional security by effectively hiding the entire internal network behind that address. NAT offers the dual functions of security and address conservation and is typically implemented in remote-access environments.

ARP Protocol -

Address Resolution Protocol (ARP) is a communication protocol used to find the MAC (Media Access Control) address of a device from its IP address. This protocol is used when a device wants to communicate with another device on a Local Area Network or Ethernet.

Q.4. Describe deadlock characteristics.

Ans: -

Explain Deadlock and its characteristics? Answer: Deadlock is a situation where two or more processes are waiting for each other. For example, let us assume, we have two processes P1 and P2. Now, process P1 is holding the resource R1 and is waiting for the resource R2. At the same time, the process P2 is having the resource R2 and is waiting for the resource R1. So, the process P1 is waiting for process P2 to release its resource and at the same time, the process P2

is waiting for process P1 to release its resource. And no one is releasing any resource. So, both are waiting for each other to release the resource. This leads to infinite waiting and no work is done here. This is called Deadlock.

characteristics:

Mutual Exclusion

There should be a resource that can only be held by one process at a time. In the diagram below, there is a single instance of Resource 1 and it is held by Process 1 only.

Hold and Wait

A process can hold multiple resources and still request more resources from other processes which are holding them. In the diagram given below, Process 2 holds Resource 2 and Resource 3 and is requesting the Resource 1 which is held by Process 1

No Preemption

A resource cannot be preempted from a process by force.

Q.5. Describe pagination in brief?

Ans: -

Virtual memory can be configured using non-contiguous memory allocation method known as Paging.

In paging technique, the program will be divided into many small blocks. And then small blocks are loaded into elsewhere in main memory.

In Paging technique, the virtual address space is divided into equal size blocks known as pages while physical memory is divided into equal size blocks called frames.

Page size is equal to the frame size. Size of the page or a frame depends on the operating system. In general, the size of page or frame is 4KB.

Virtual memory configured using paging technique has operating system maintaining a data structure to map logical address to the physical address.

This data structure is known as page table.

The page table contains two fields:

Page number

Frame number

Advantages of Paging

Listed below are advantages of paging:

The paging technique is easy to implement.

The paging technique makes efficient utilization of memory.

The paging technique supports time-sharing system.

The paging technique supports non-contiguous memory allocation

Disadvantages of Paging

Listed below are disadvantages of paging:

Paging may encounter a problem called page break.

When the number of pages in virtual memory is quite large, maintaining page table become hectic.