**DAY -1**

**1.** **What are pros & cons of every mapping technique?**

**Direct mapping**

Definition: A memory mapping technique where each memory address is mapped to a single physical address.

Pros:

* Simple to implement and manage
* Low hardware overhead

Cons:

* High conflict miss rate
* Poor performance for workloads with poor spatial locality

**Conflict miss rate**: The percentage of memory requests that miss the cache because the desired data is in the same cache line as other data that is currently being used.

**Spatial locality**: The tendency of memory accesses to be clustered together in physical memory.

**Set associative mapping**

Definition: A memory mapping technique where each memory address is mapped to a set of physical addresses.

Pros:

* Lower conflict miss rate than direct mapping
* Better performance for workloads with moderate spatial locality

Cons:

* More complex to implement and manage than direct mapping
* Higher hardware overhead than direct mapping.

**Fully associative mapping**

Definition: A memory mapping technique where each memory address can be mapped to any physical address.

Pros:

* Lowest conflict miss rate of all mapping techniques
* Best performance for workloads with good spatial locality

Cons:

* Most complex to implement and manage
* Highest hardware overhead of all mapping techniques

Mind mapping

Definition: A graphical technique for organizing and brainstorming ideas.

Pros:

* Helps to visualize complex information
* Can be used to generate new ideas
* Can be used to break down tasks into smaller steps

Cons:

* Can be time-consuming to create
* Can be difficult to share with others
* Can be difficult to maintain as information changes

Mapping method of note-taking

Definition: A note-taking method that uses diagrams and other visual elements to represent relationships between concepts.

Pros:

* Helps to identify relationships between concepts
* Easy to review and edit
* Can be used to create visually appealing notes

Cons:

* Can be difficult to create for complex topics
* Can be difficult to share with others
* Can be difficult to maintain as information changes

Shadow mapping

Definition: A rendering technique that casts shadows by projecting a scene from the light's perspective onto a shadow map.

Pros:

* Relatively simple and fast to implement
* Can be used to create realistic and immersive 3D animations

Cons:

* Can suffer from aliasing and jagged edges
* Does not handle soft shadows very well

Aliasing: A phenomenon where a curved or diagonal line is represented by a series of stepped lines.

Jagged edges: A phenomenon where the edges of objects in a rendered image appear to be stair-stepped.

Soft shadows: Shadows that have a gradual falloff, rather than a sharp edge.

Shadow volumes

Definition: A rendering technique that casts shadows by casting volume primitives from the light's perspective onto the scene.

Pros:

* Can be used to create realistic and immersive 3D animations
* Handles soft shadows well

Cons:

* More complex and slower to implement than shadow mapping

Volume primitives: Basic geometric shapes, such as cubes, spheres, and cones.

I hope this helps!

**2. Which mapping technique is most optimized?**

Fully associative mapping is the most optimized mapping technique. It has the lowest conflict miss rate and the best performance for workloads with good spatial locality. However, it is also the most complex and expensive mapping technique to implement.

Set associative mapping is a good compromise between fully associative mapping and direct mapping. It has a lower conflict miss rate than direct mapping and a lower implementation cost than fully associative mapping.

Direct mapping is the least optimized mapping technique, but it is also the simplest and least expensive to implement. It is a good choice for applications with low performance requirements.

In general, the best mapping technique for a particular application depends on the performance requirements and the cost constraints.

Here are some factors to consider when choosing a mapping technique:

* Performance requirements: How important is performance for the application?
* Cost constraints: How much is the organization willing to spend on implementing and maintaining the mapping technique?
* Workloads: What types of workloads will the application be running?
* Memory size: How much memory does the application need?

If performance is the most important factor, then fully associative mapping is the best choice. If cost is the most important factor, then direct mapping is the best choice. If the application has moderate performance requirements and cost constraints, then set associative mapping is a good choice.

It is also important to consider the workloads that the application will be running. If the application has good spatial locality, then fully associative mapping will perform the best. If the application has poor spatial locality, then direct mapping may perform better.

Finally, the size of the memory should also be considered. If the memory is small, then direct mapping is a good choice. If the memory is large, then set associative mapping or fully associative mapping may be a better choice.

**3.**