
GPU & Graphic Card

3D Rendering으로 보는 GPU와 Graphic Card

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20182613 박상준

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- 3D Rendering pipeline

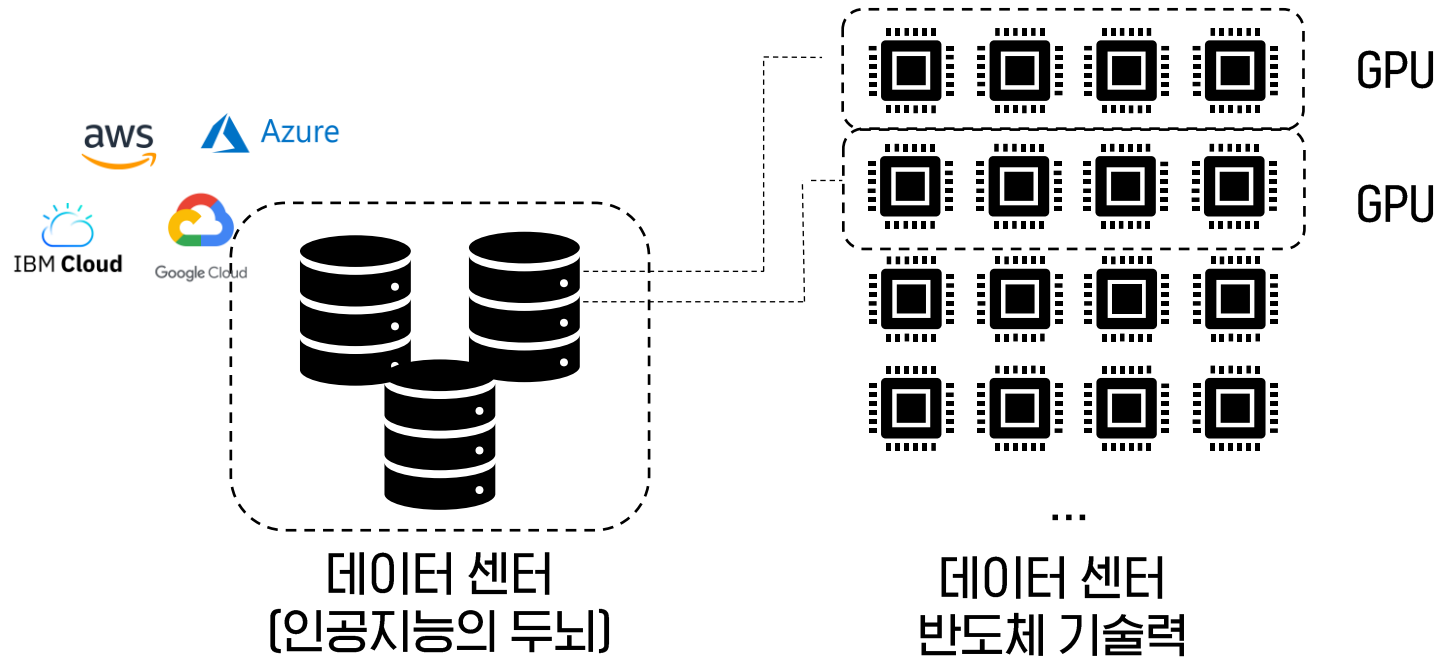
GPU & Graphic Cards

>> NVIDIA 주가 상승 요인



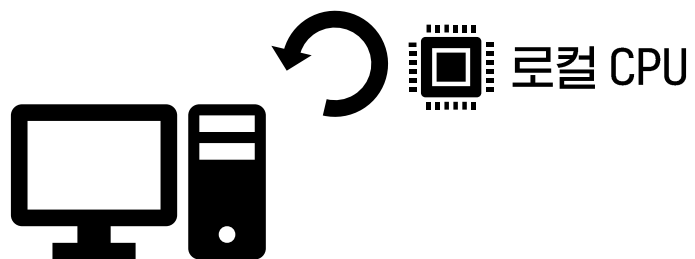
GPU & Graphic Cards

>> NVIDIA 주가 상승 요인

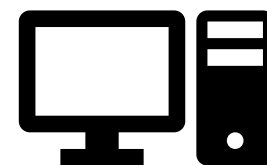


GPU & Graphic Cards

>> NVIDIA 주가 상승 요인



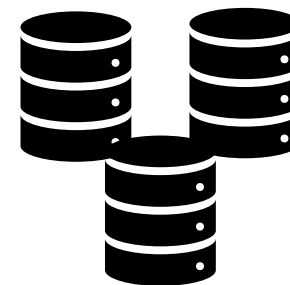
과거의 연산 방법



로컬 PC



클라우드

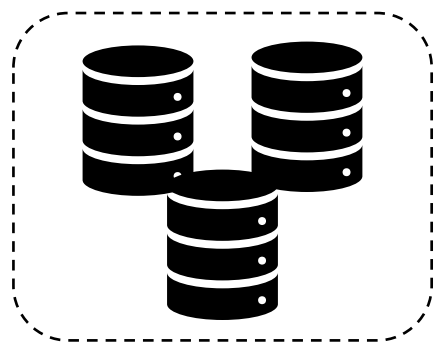


데이터센터

현재의 연산 방법

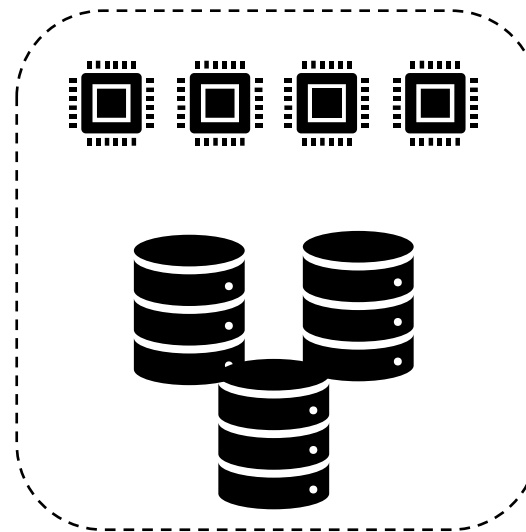
GPU & Graphic Cards

>> NVIDIA 주가 상승 요인



데이터센터
[과거]

단순한 저장소의 역할



데이터센터
[현재]

“AI 가속기”

신약 개발

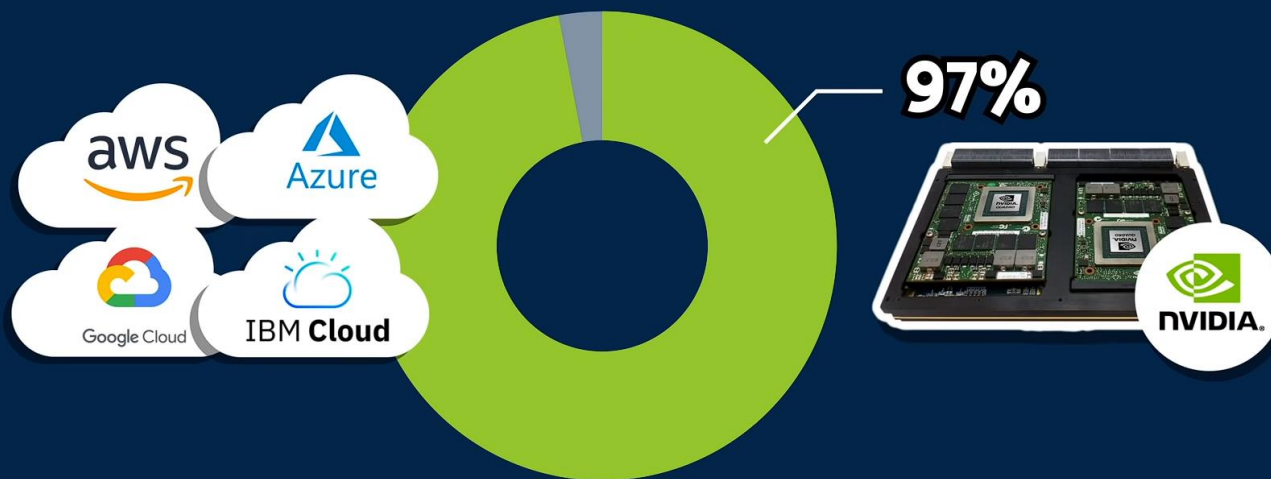
기후 예측 시뮬레이션

...

GPU & Graphic Cards

>> NVIDIA 주가 상승 요인

데이터센터에 탑재되는 반도체 점유율

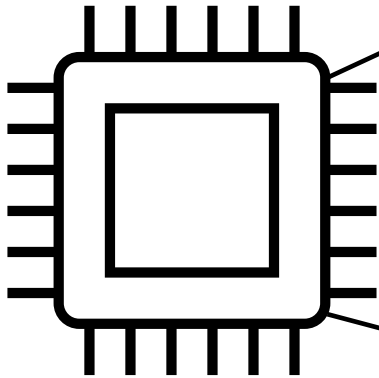


데이터센터
[과거]

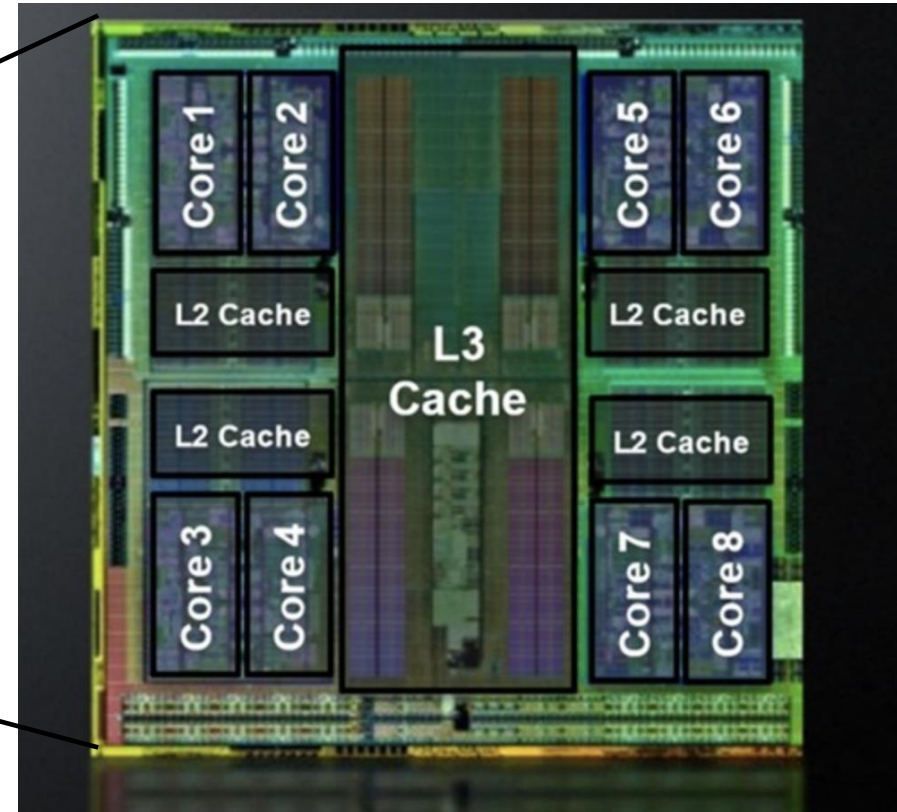
“AI 가속기”
신약 개발
후 예측 시뮬레이션
...

CPU vs GPU

>> CPU 동작 방식



Central Processing Unit (CPU)

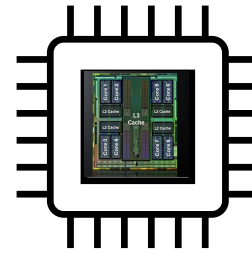


1개 이상의 Core & L1, L2, L3 Cache

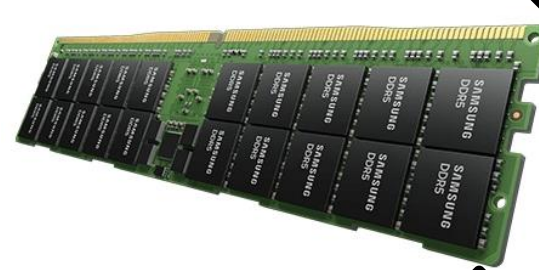
CPU vs GPU

>> CPU 동작 방식

컴퓨터 구조



Central Processing Unit (CPU)



Memory (DRAM)



SSD

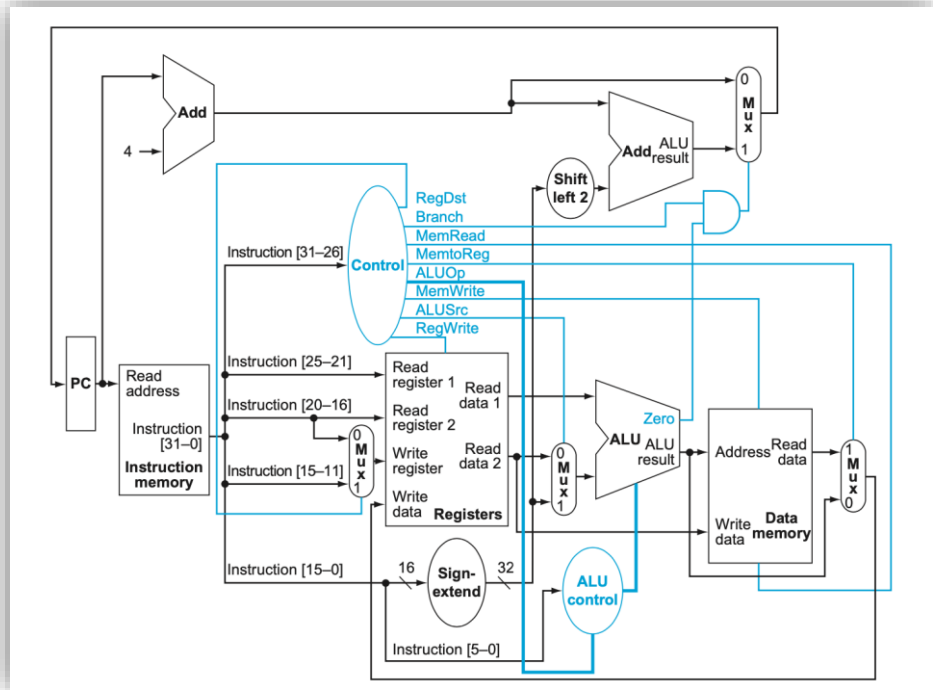
Or



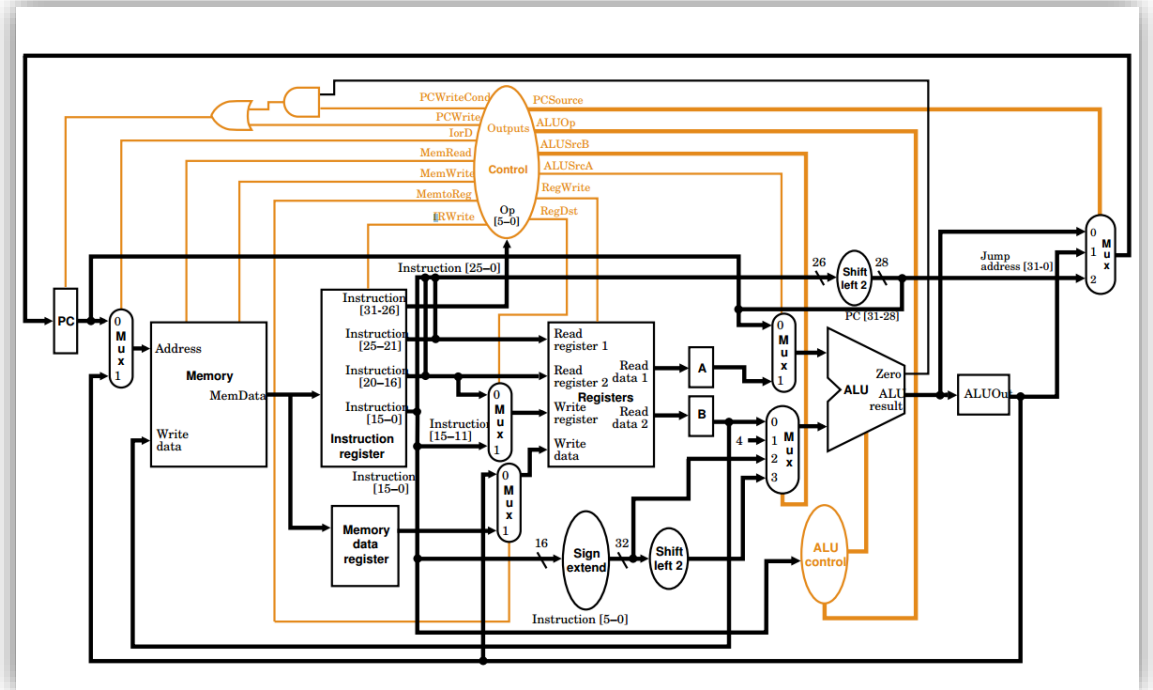
HDD

CPU vs GPU

>> CPU 동작 방식



MIPS single-cycle processor pipeline



MIPS multi-cycle processor pipeline

CPU vs GPU

>> CPU 동작 방식

복잡한 연산 수행을 위한 설계 -> 복잡한 구조

순차 처리에 최적화 되어 있음
(코드를 메모리에 올리고, PC 레지스터를 활용)

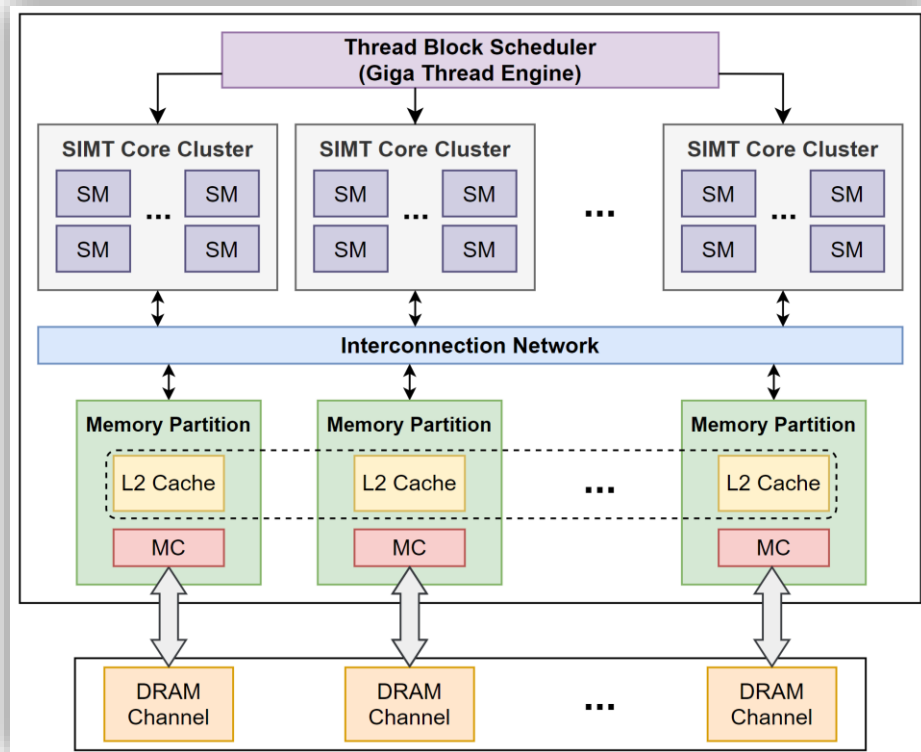
CPU 코어 하나 당 가격이 비싼 편

MIPS single-cycle processor pipeline

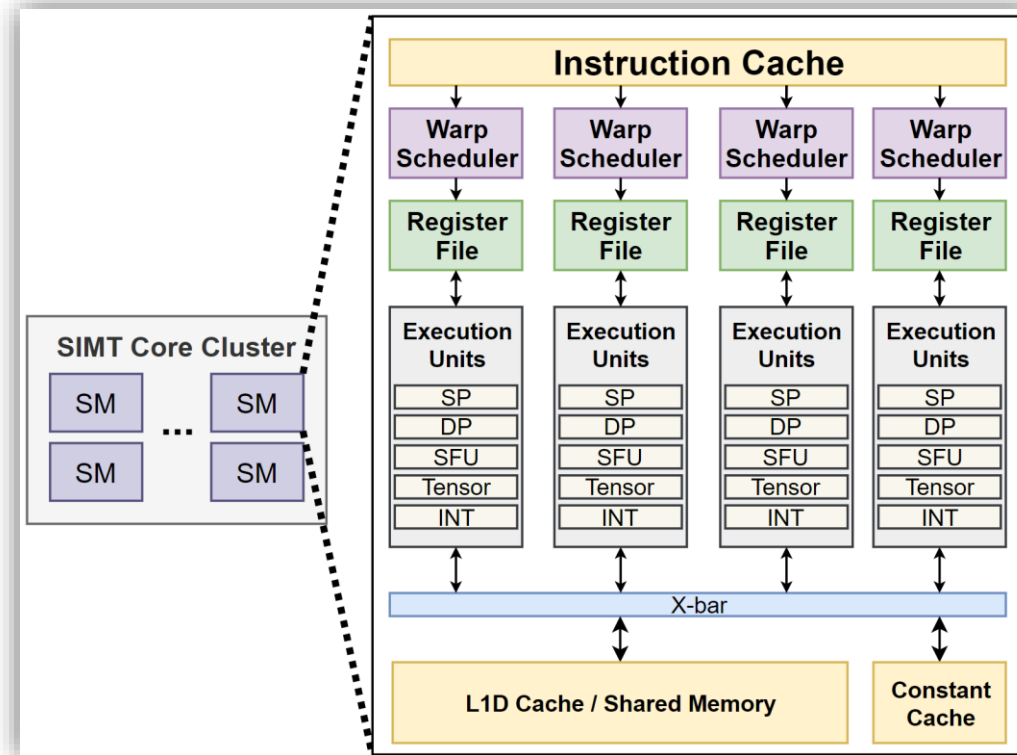
MIPS multi-cycle processor pipeline

CPU vs GPU

>> GPU 동작 방식



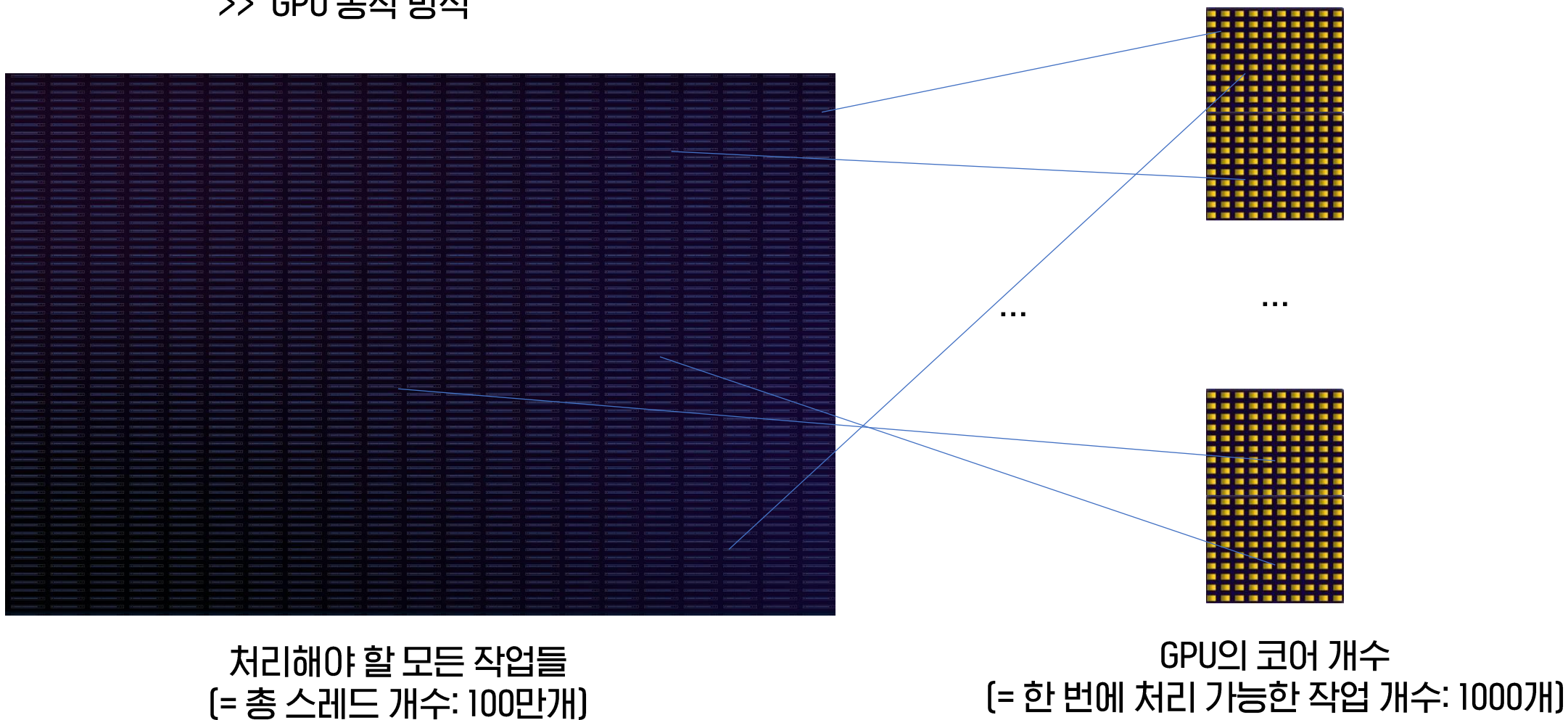
NVIDIA GPU 내부 구조



NVIDIA GPU의 SM 내부 구조

CPU vs GPU

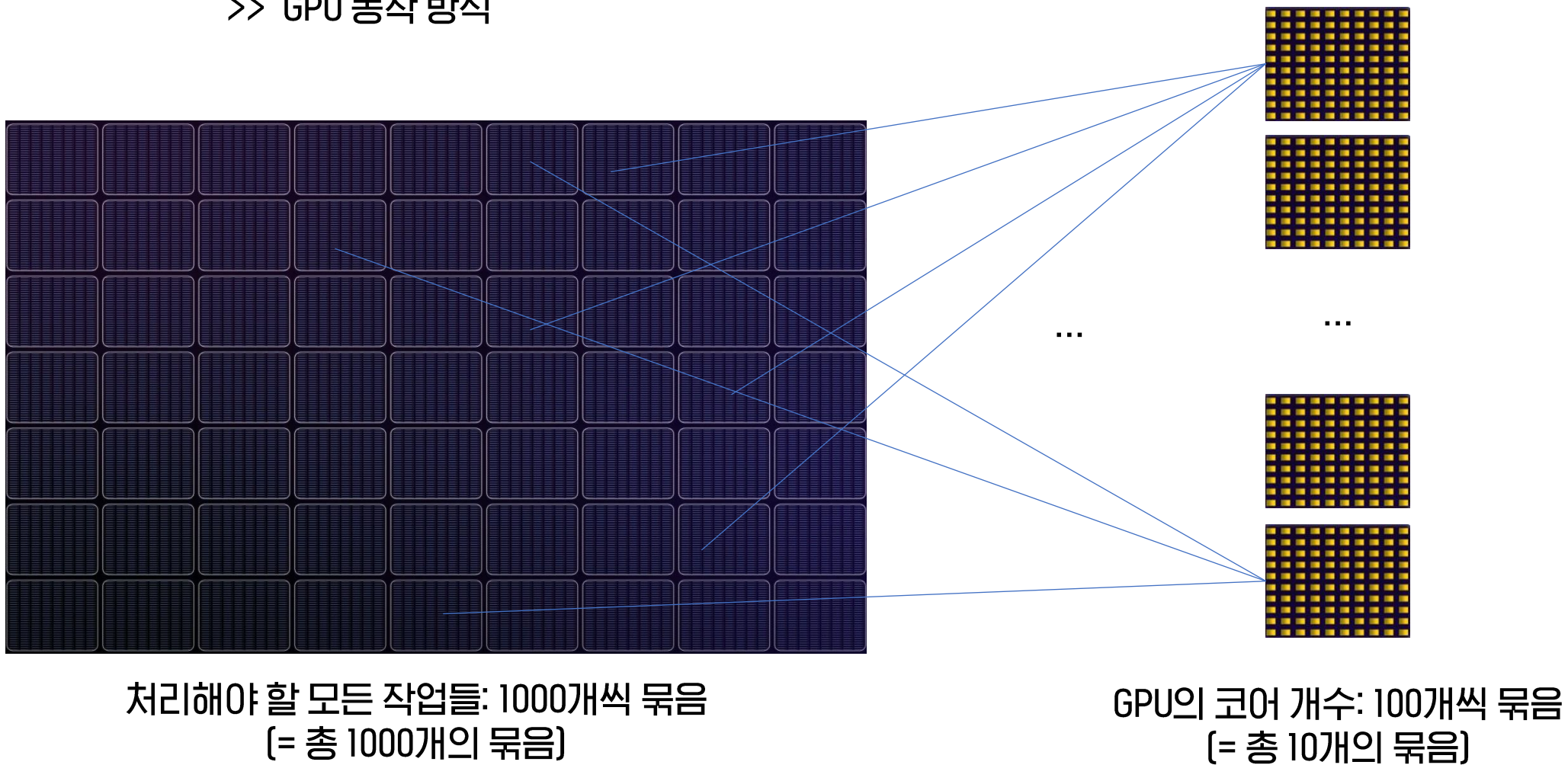
>> GPU 동작 방식



>> 100만개를 1000개에 각각 할당

CPU vs GPU

>> GPU 동작 방식



>> 1000개를 100개 그룹에 각각 할당

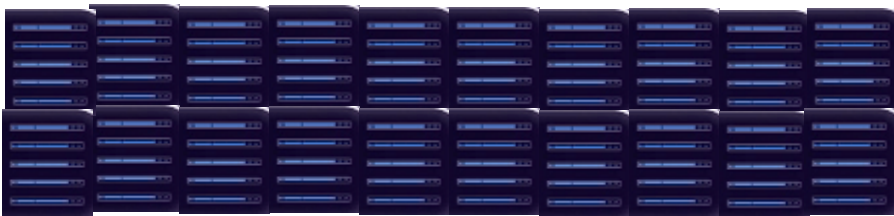
CPU vs GPU

>> GPU 동작 방식

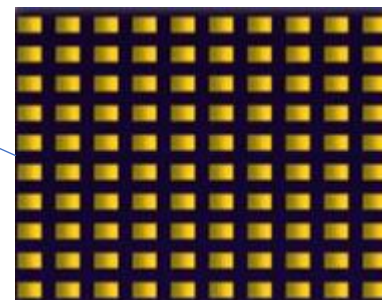


Warp: 100개의 스레드

...



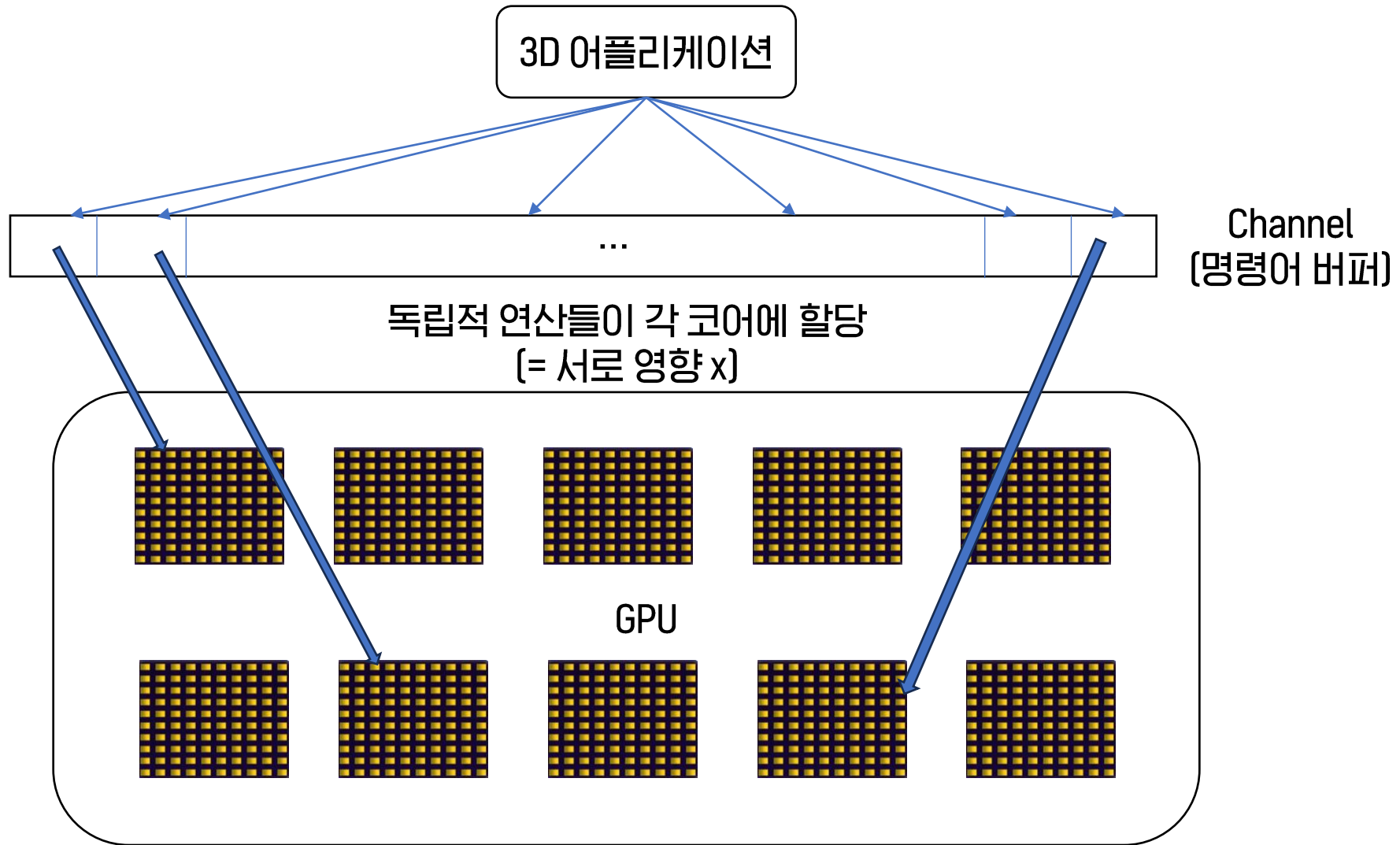
처리해야 할 모든 작업들
[= 총 스레드 개수]



GPU의 코어 개수
[= 한 번에 처리 가능한 작업 개수]

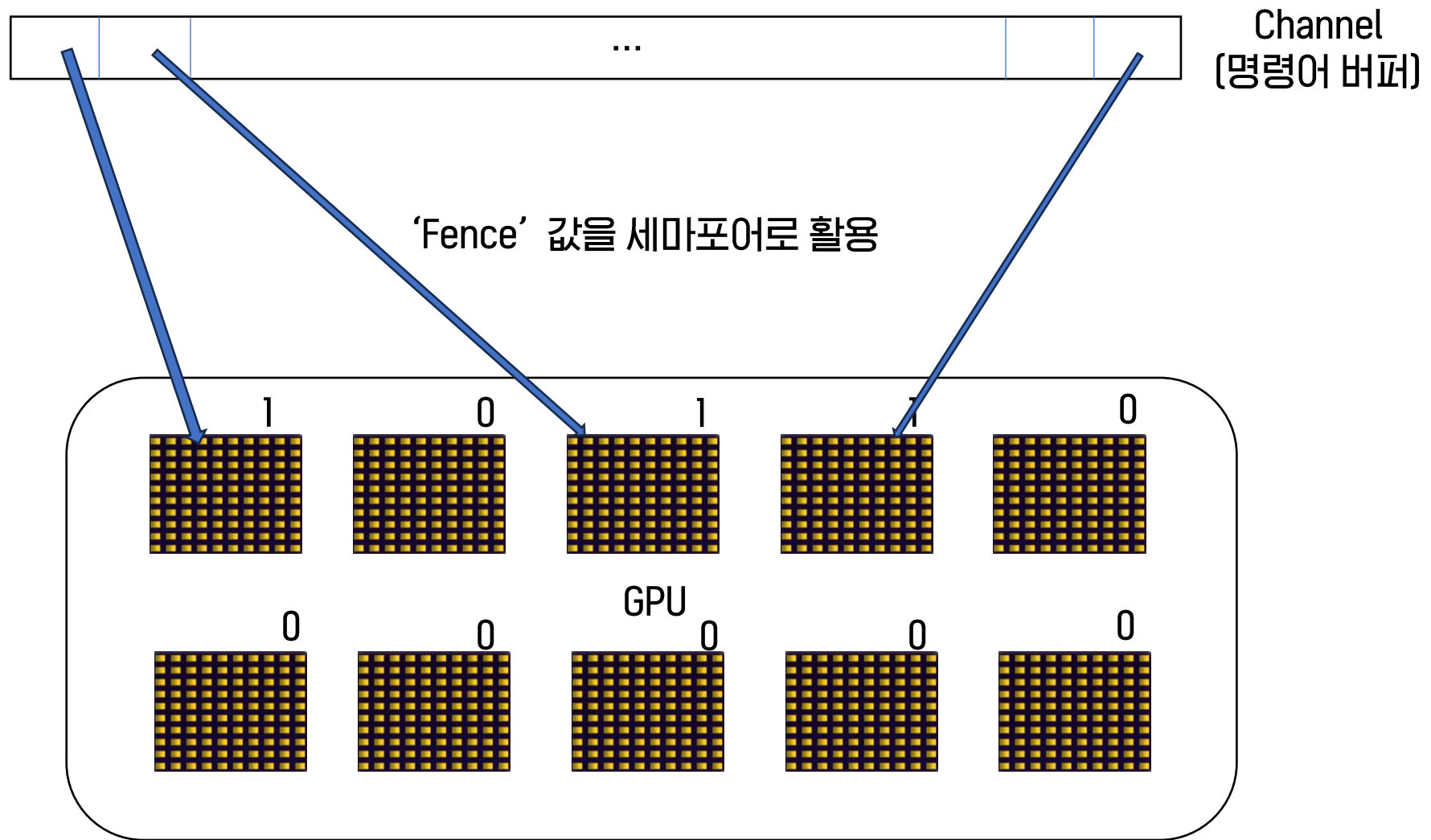
CPU vs GPU

>> GPU 동작 방식



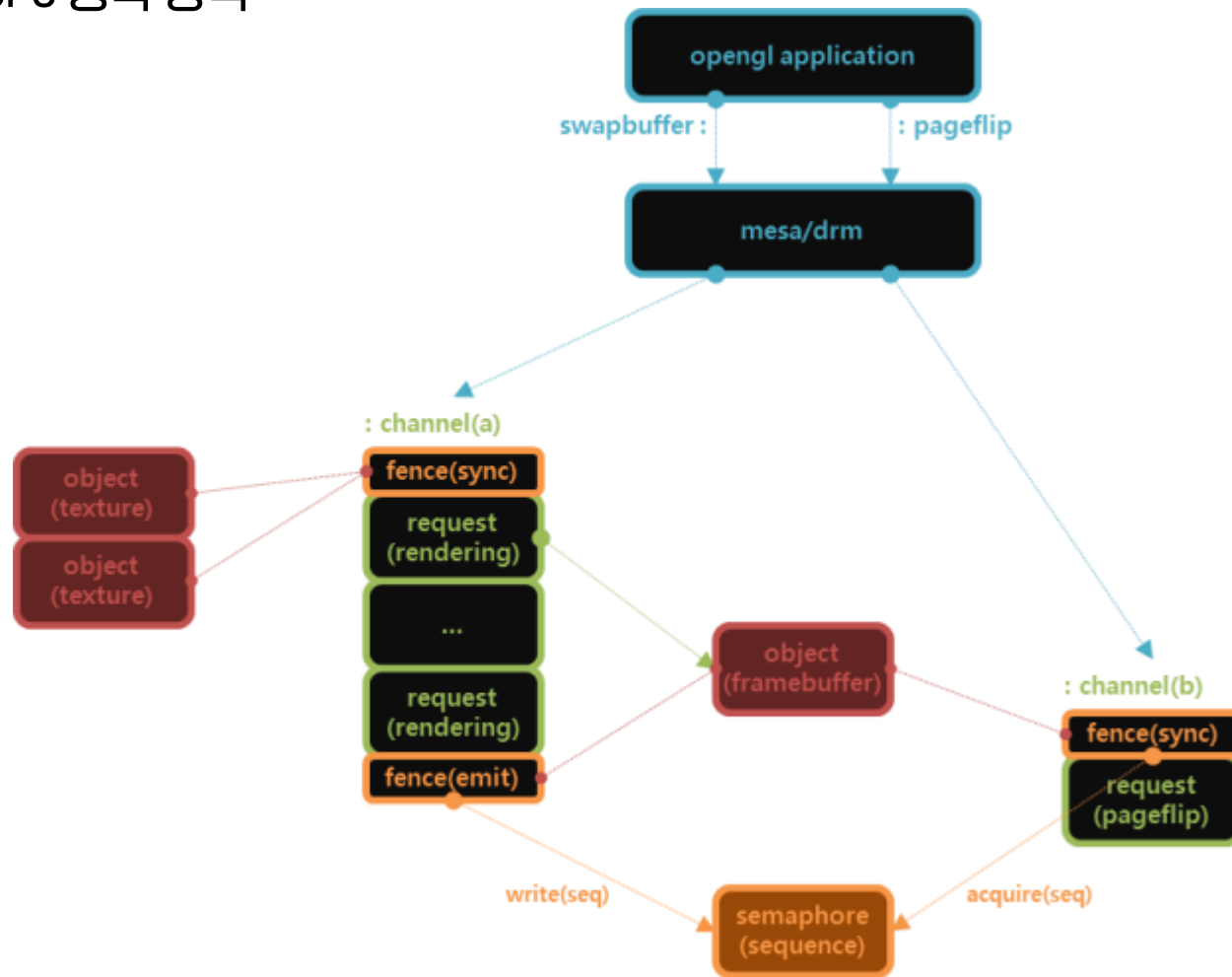
CPU vs GPU

>> GPU 동작 방식



CPU vs GPU

>> GPU 동작 방식



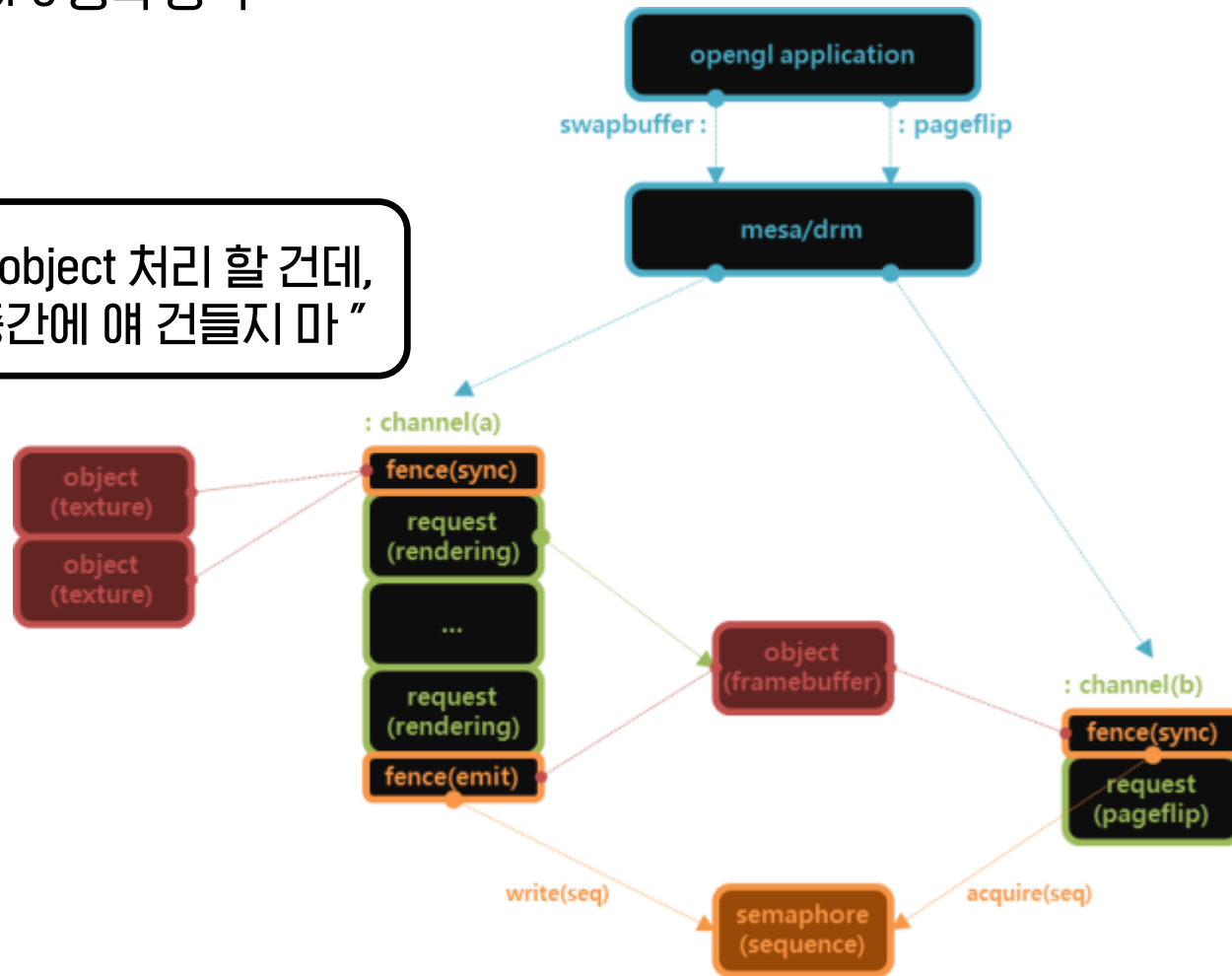
*// Texture 과정 이후 framebuffer 수행

CPU vs GPU

>> GPU 동작 방식

CPU가 Channel에 명령어 집어 넣음

“나 texture object 처리 할 건데,
처리하는 중간에 애 건들지 마”

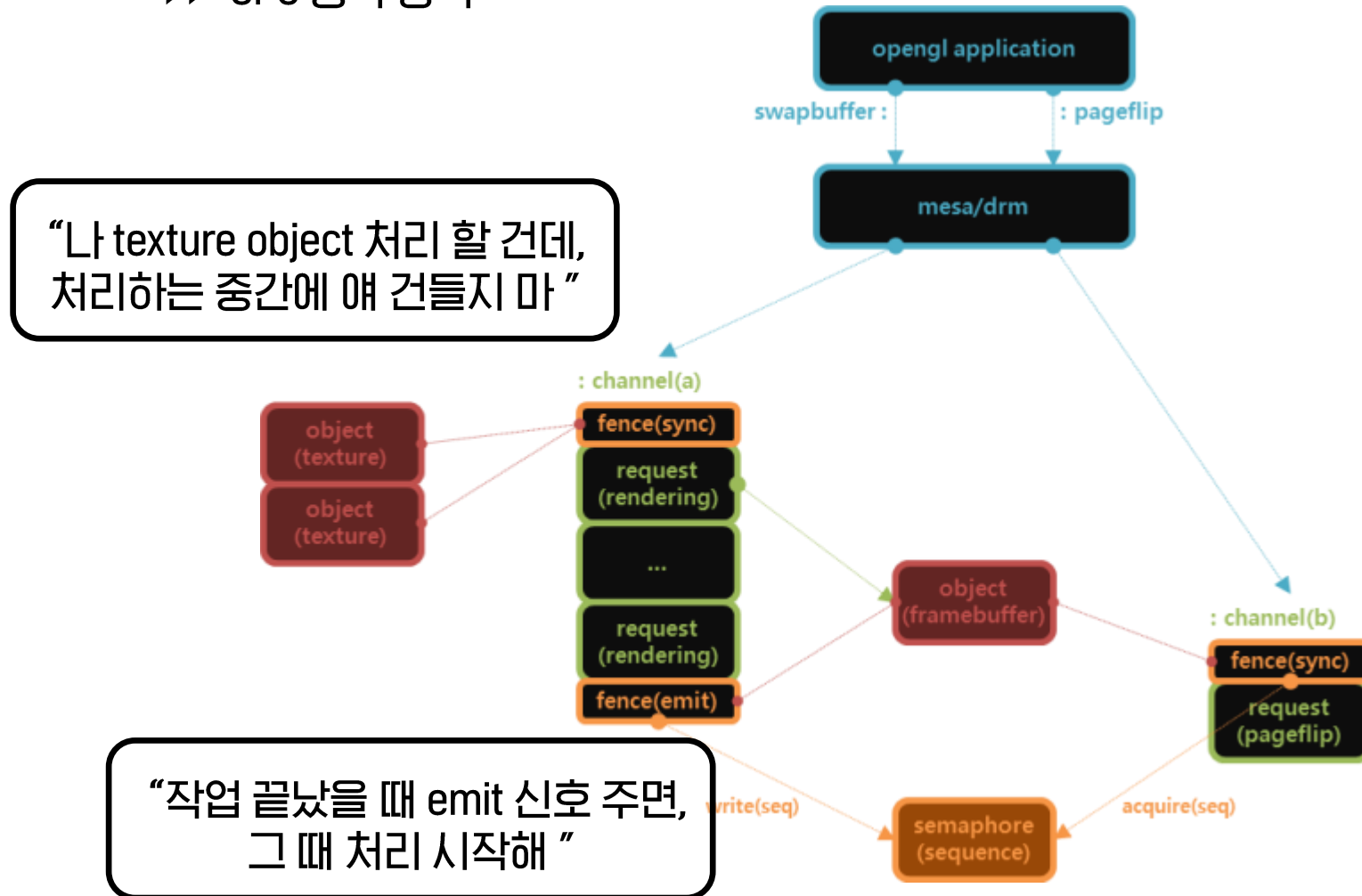


*// Texture 과정 이후 framebuffer 수행

CPU vs GPU

>> GPU 동작 방식

CPU가 Channel에 명령어 집어 넣음

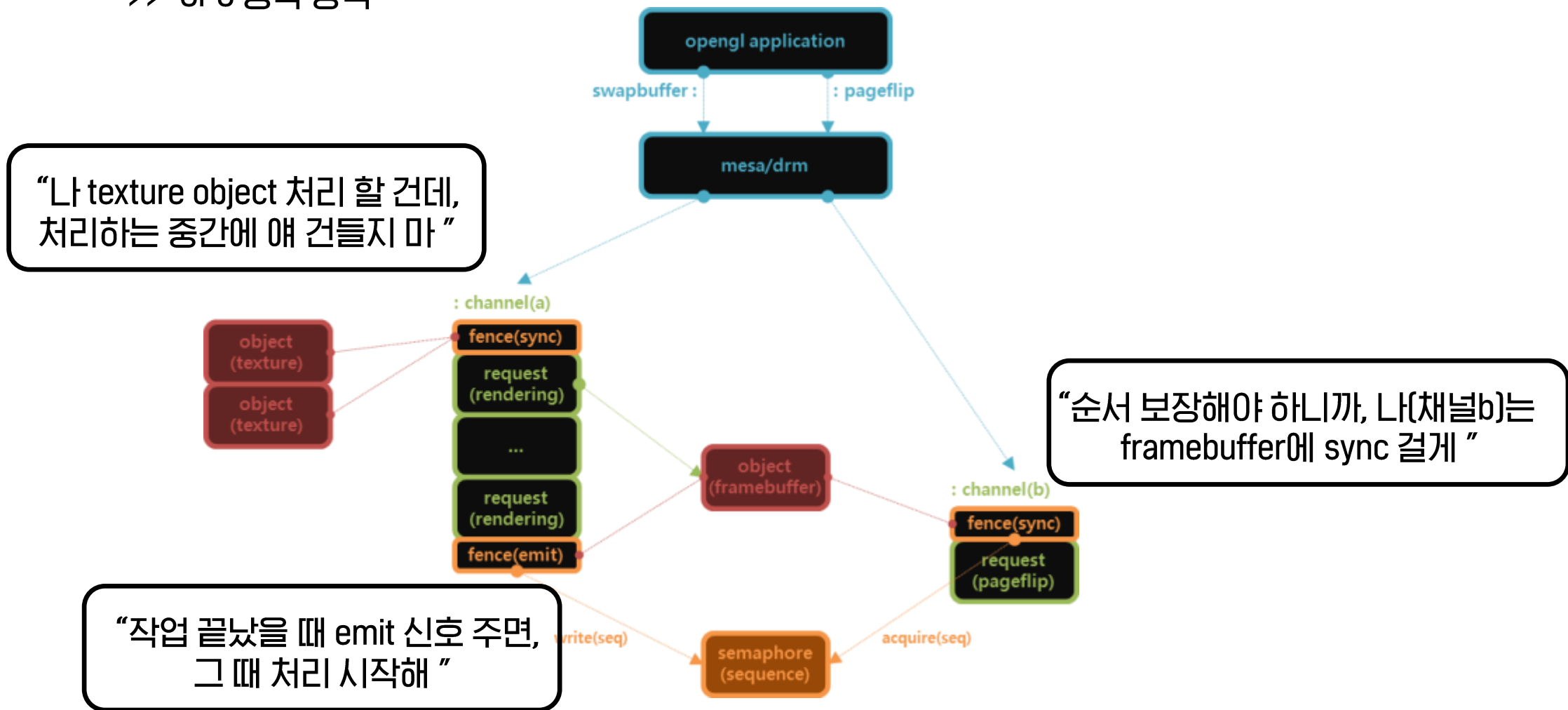


*// Texture 과정 이후 framebuffer 수행

CPU vs GPU

>> GPU 동작 방식

CPU가 Channel에 명령어 집어 넣음



*// Texture 과정 이후 framebuffer 수행

CPU vs GPU

>> 정리

GPU도 CPU에 제어되는 보조 장치이다.

병렬 처리가 가능한 것은, 코어의 개수가 훨씬 많기 때문이다.

GPU 내에서도 순서가 필요한 작업은 세마포어에 대응되는 개념을 차용한다.

매 번 CPU가 동일한 요청을 보내는 것이 아닌, 명령어를 채널에 할당하여 GPU가 비동기적으로 처리한다.

3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

Clipping

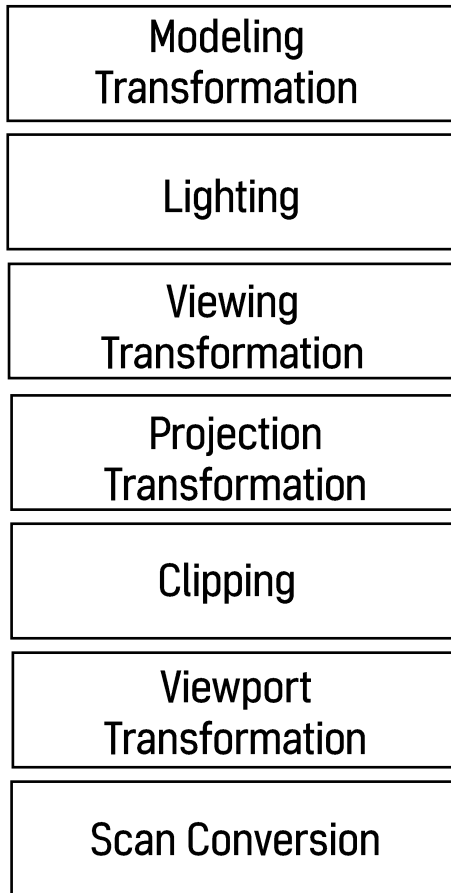
Viewport
Transformation

Scan Conversion

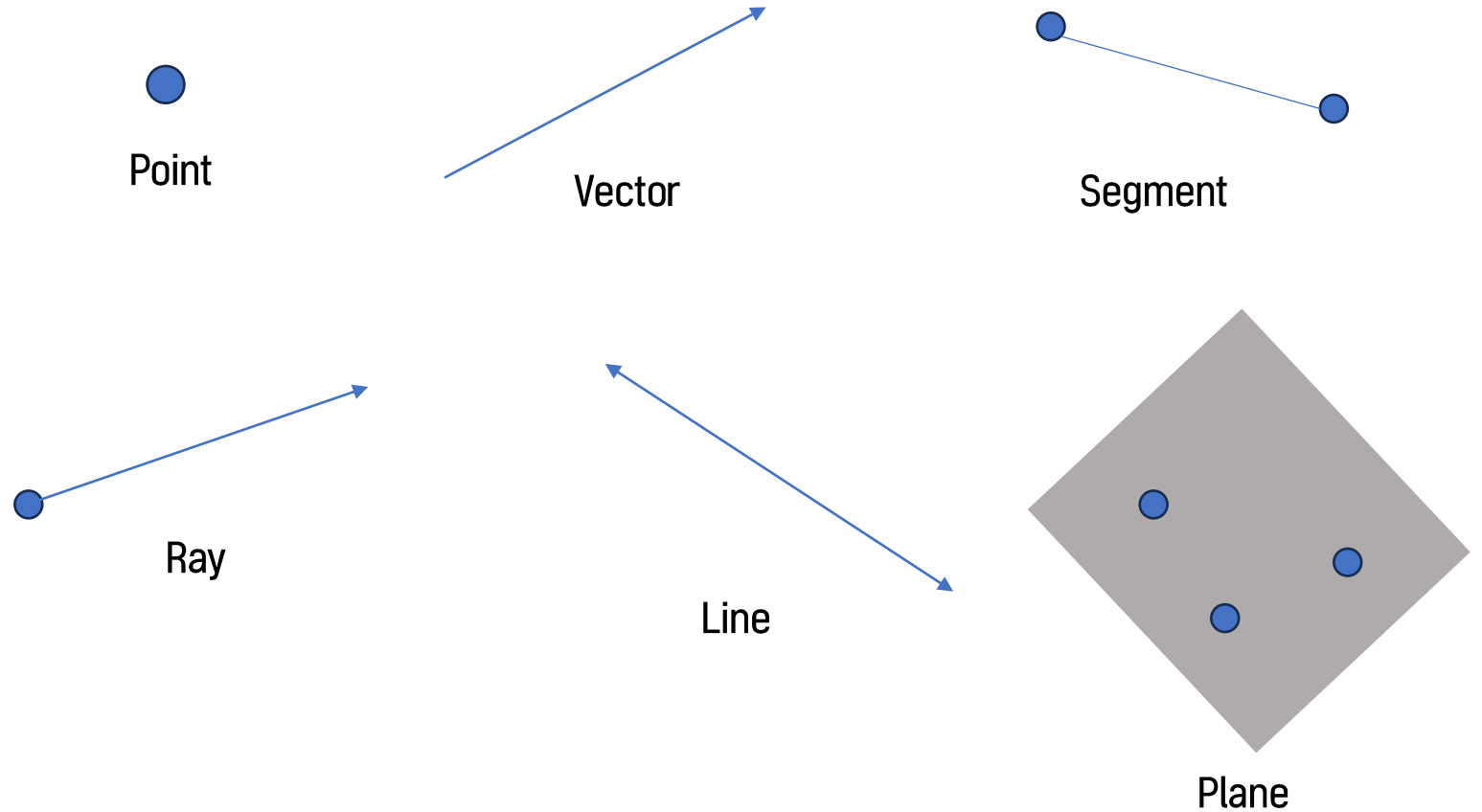
Image

3D Rendering Pipeline

3D Primitives



Image



3D Primitives

3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

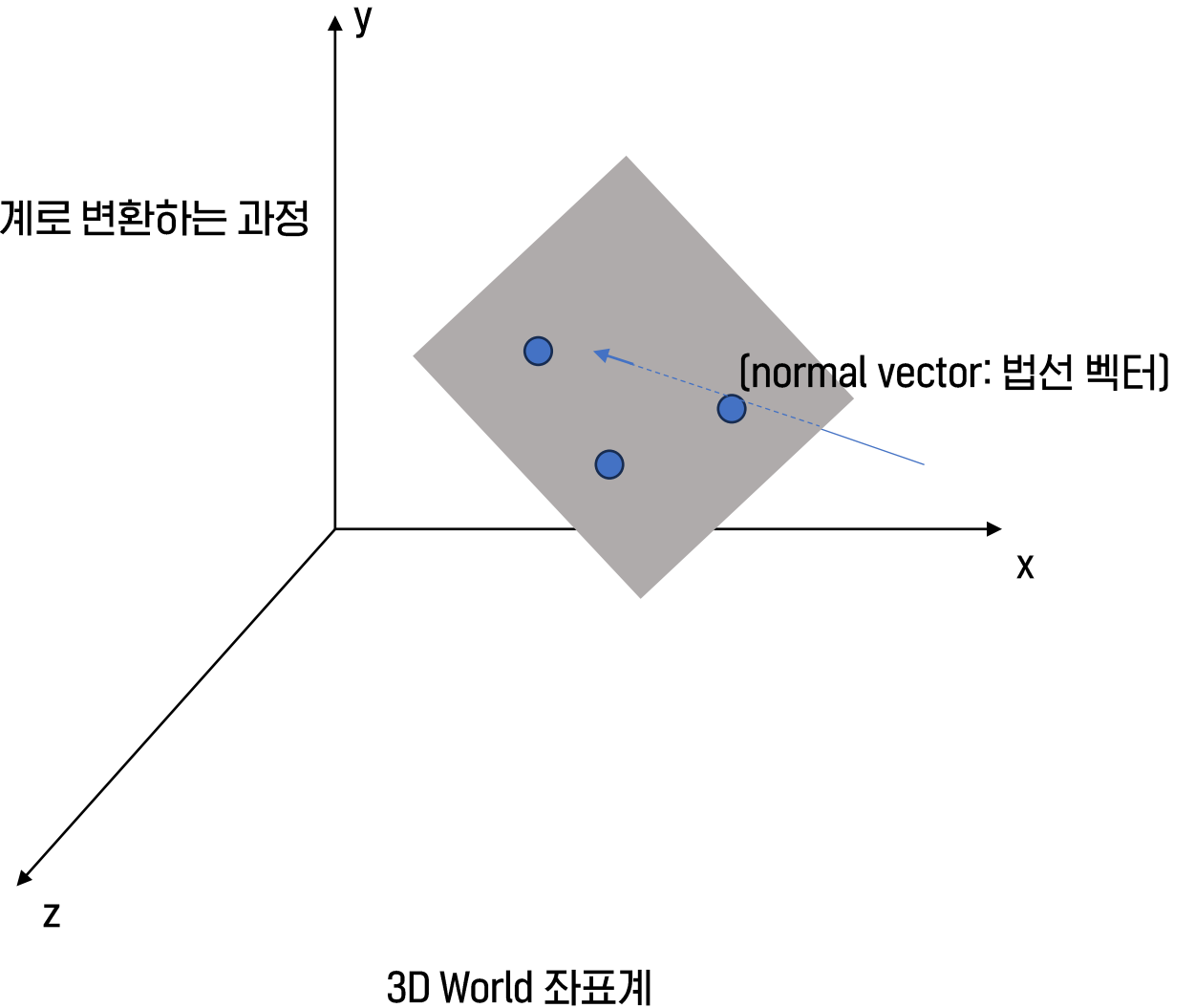
Clipping

Viewport
Transformation

Scan Conversion

Image

3D primitives 를 3D World 좌표계로 변환하는 과정



3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

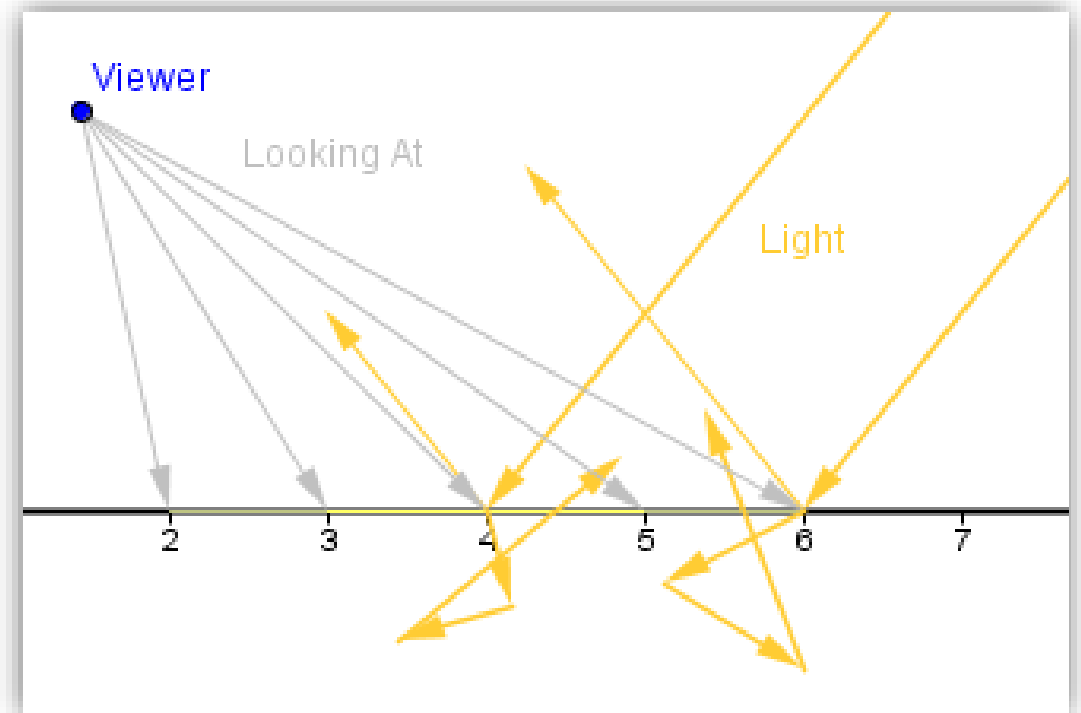
Clipping

Viewport
Transformation

Scan Conversion

Image

빛의 반사, 굴절 처리



3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

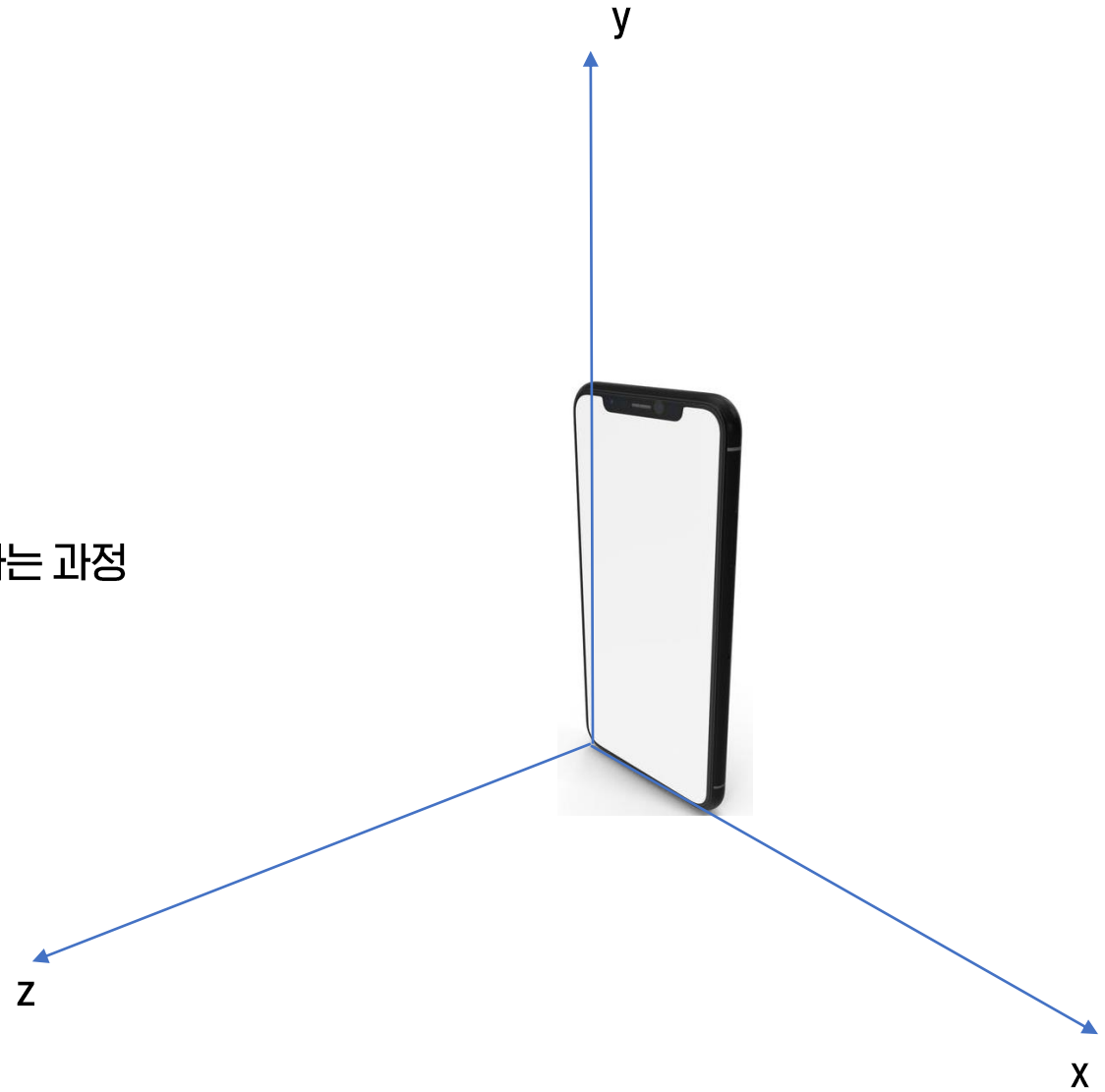
Clipping

Viewport
Transformation

Scan Conversion

Image

3D Camera의 좌표계로 설정하는 과정



3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

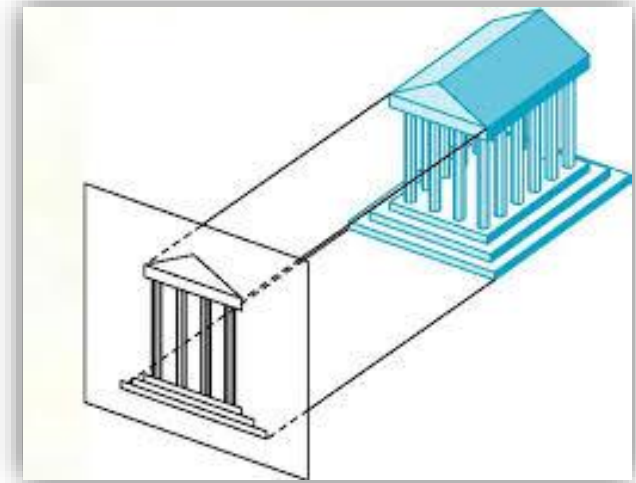
Clipping

Viewport
Transformation

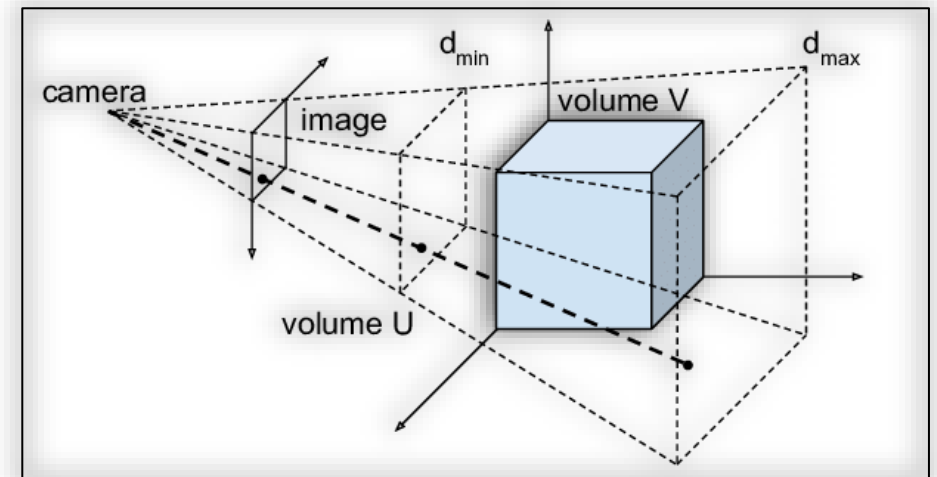
Scan Conversion

Image

2D Camera의 좌표계로 설정하는 과정



Parallel Projection



Perspective Projection

3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

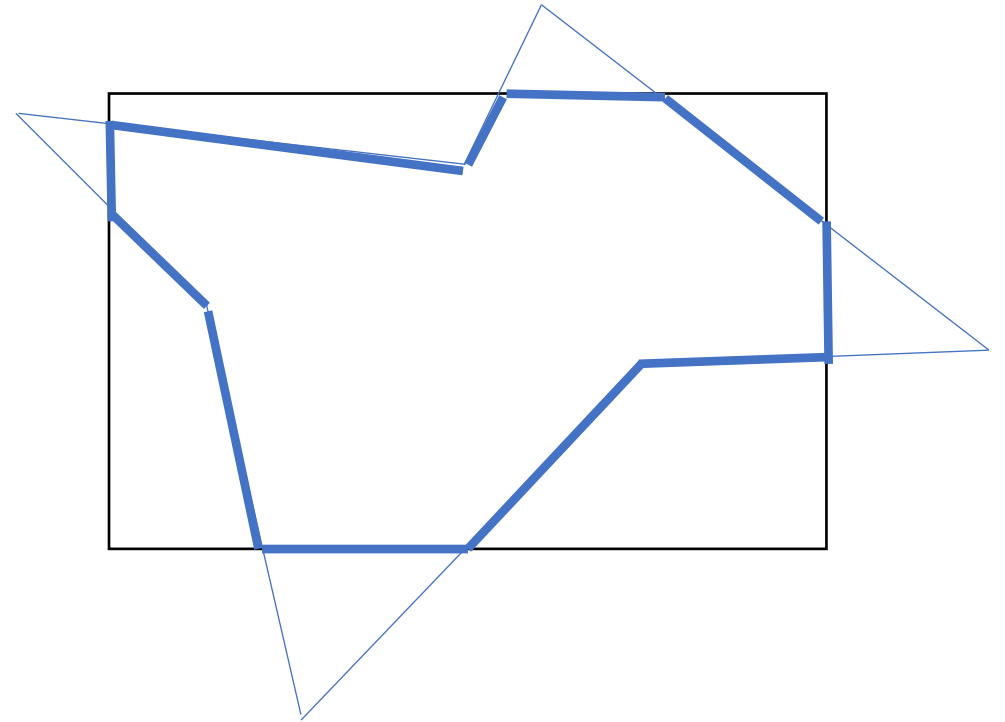
Clipping

Viewport
Transformation

Scan Conversion

Image

화면에 표시되지 않는 영역 제거



3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

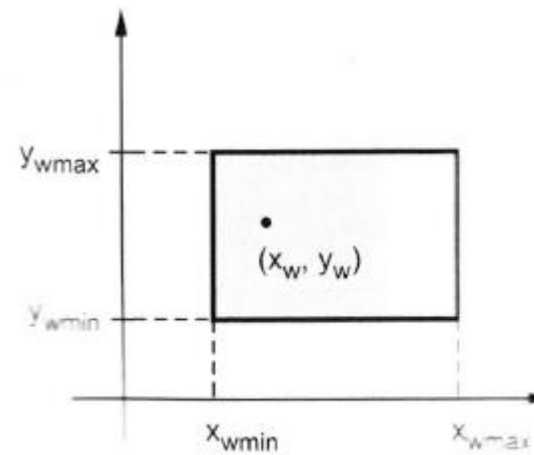
Clipping

Viewport
Transformation

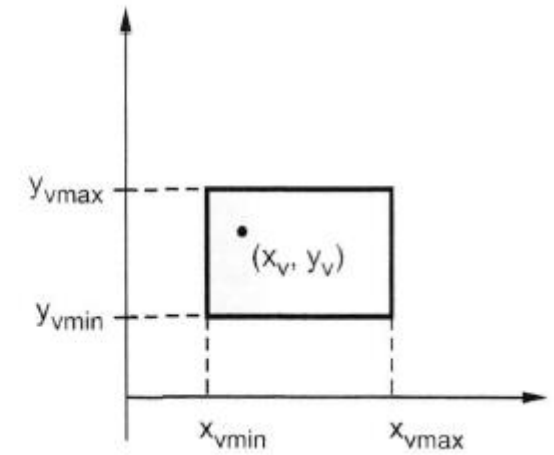
Scan Conversion

Image

Window



Viewport



Window와 Viewport 처리 과정

3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

Projection
Transformation

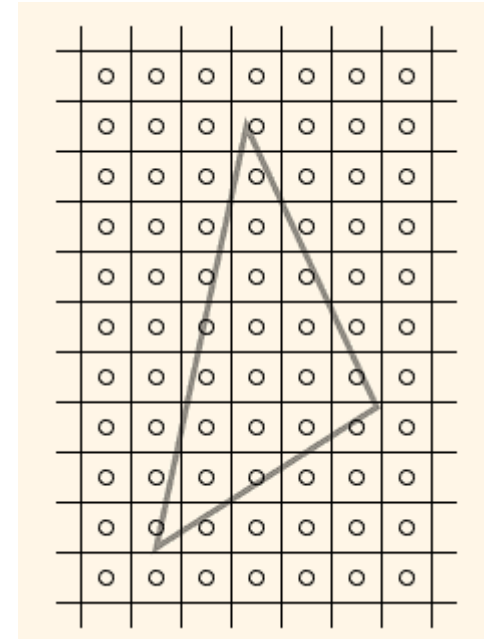
Clipping

Viewport
Transformation

Scan Conversion

Image

실제로 채울 모니터 픽셀의 위치 계산 과정



3D Rendering Pipeline

3D Primitives

Modeling
Transformation

Lighting

Viewing
Transformation

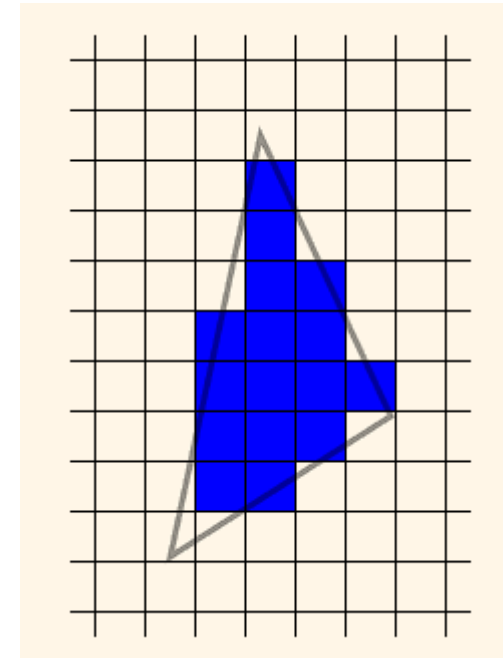
Projection
Transformation

Clipping

Viewport
Transformation

Scan Conversion

Image



Shading

픽셀 선택 후, 어떤 색상으로 칠할 것인지 결정하는 과정

감사합니다.