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BEGINNING METAL

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PART 2: GETTING STARTED



GPU vs CPU

- ▶ Apple's A9 chip
- ▶ The CPU has a few powerful processors
- ▶ The GPU has multiple less powerful processors



CPU DEMONSTRATION

1	4	3	10	6	8	6	1	8
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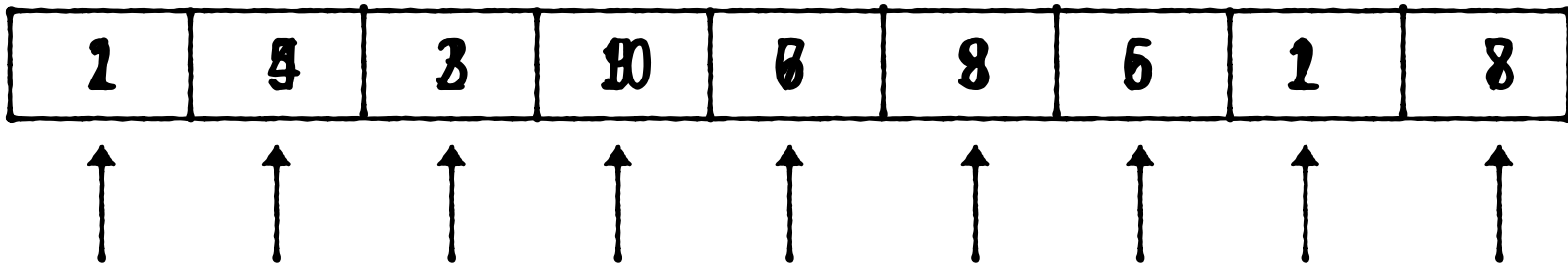
↑
add 1

pseudo-code: **add 1** to each item in the array

CPU has few processors



GPU DEMONSTRATION

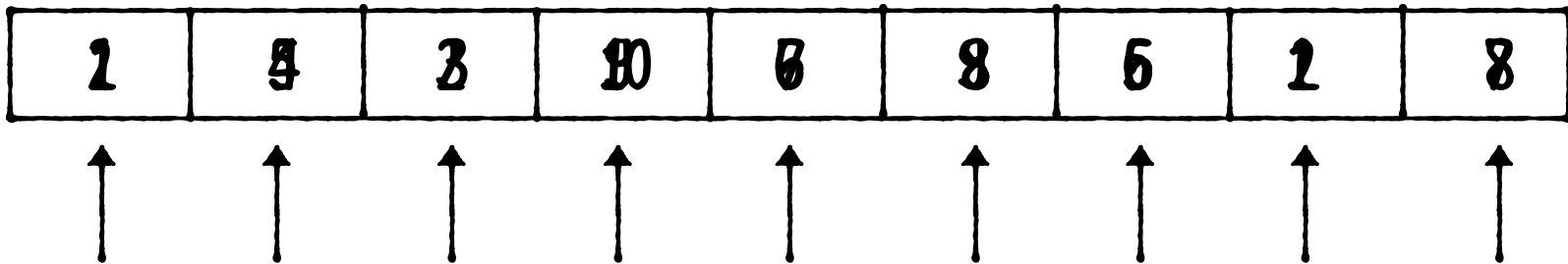


pseudo-code: **add 1**

GPU has many processors



GPU DEMONSTRATION

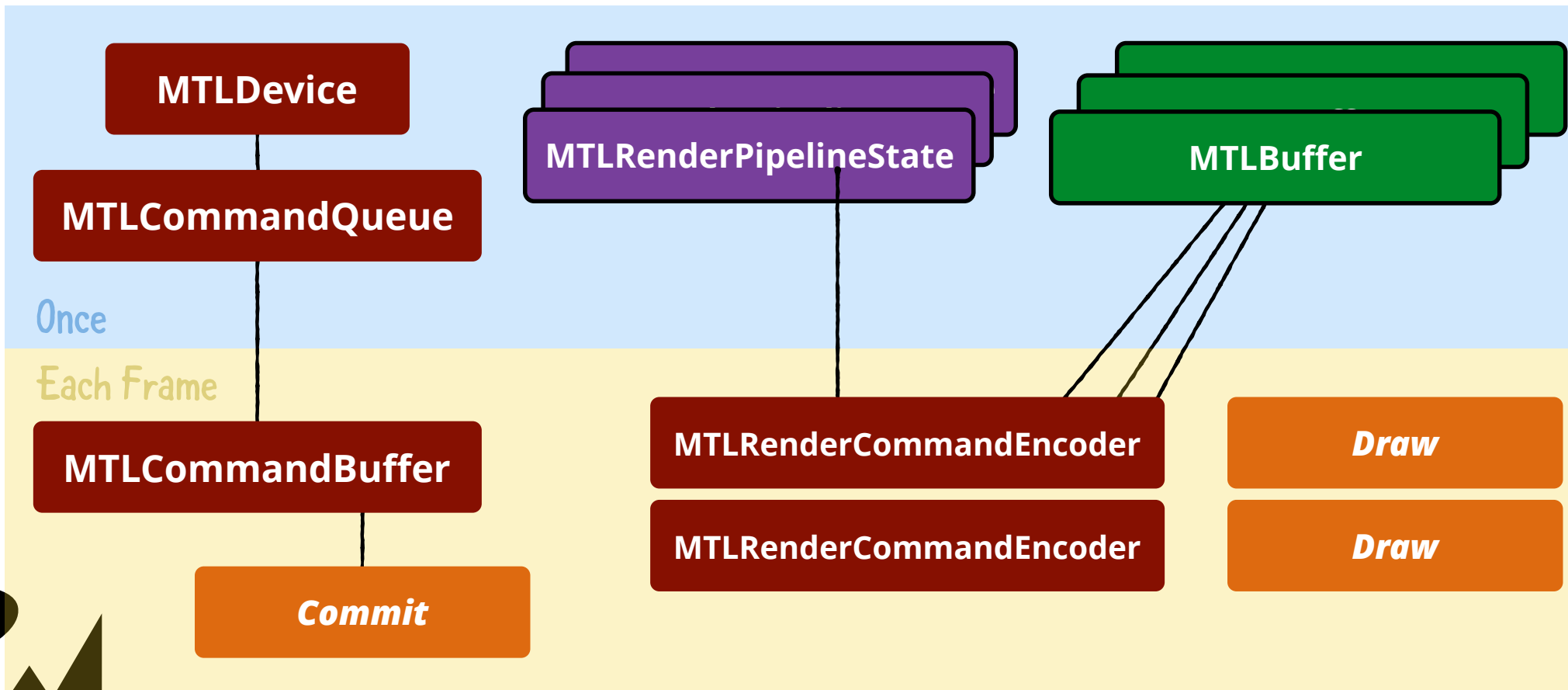


pseudo-code: **add 1**

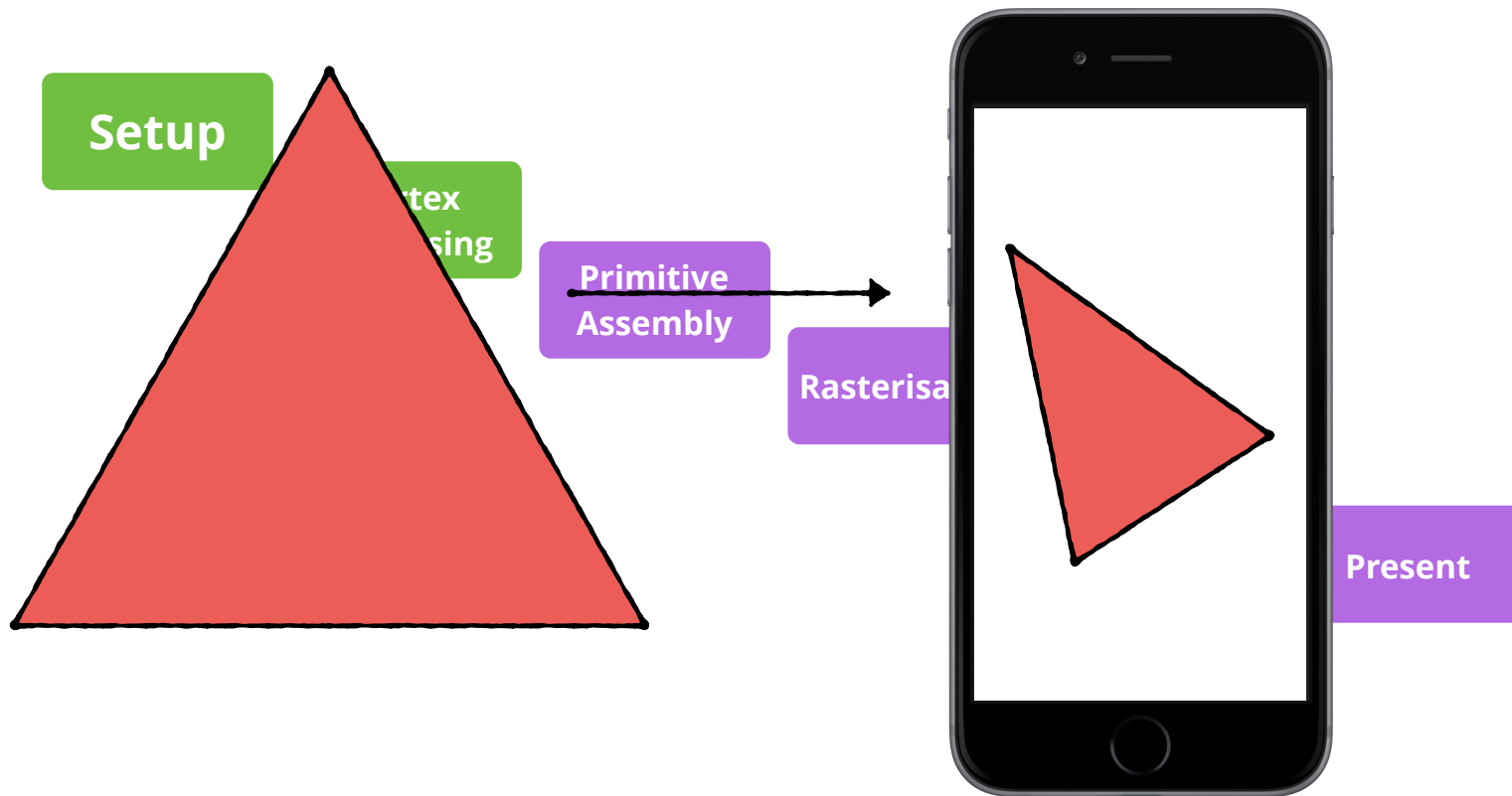
GPU has many processors



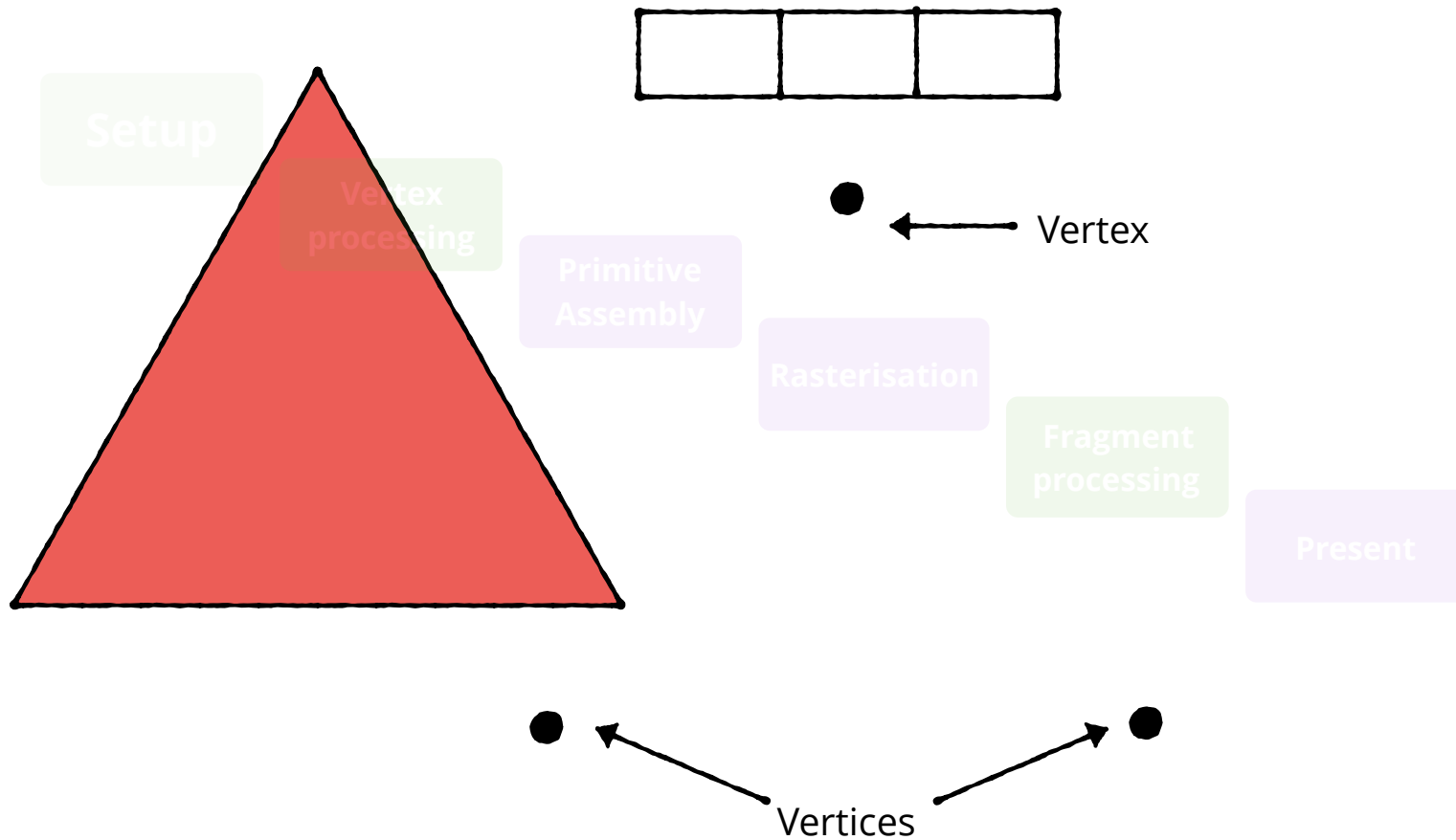
METAL DRAWING OVERVIEW



THE METAL PIPELINE



THE METAL PIPELINE



THE METAL PIPELINE

Setup

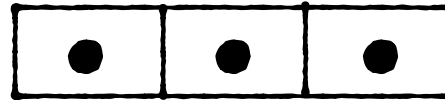
Vertex
processing

Primitive
Assembly

Rasterisation

Fragment
processing

Present



```
vertex float4 vertex_shader(const device packed_float3 *vertices [[buffer(0)]],  
                           constant Constants &constants [[buffer(1)]],  
                           uint vertexIn [[vertex_id]]) {  
    float4 position = float4(vertexIn.position, 1);  
    position = constants.modelMatrix * position;  
    return position;  
}
```



THE METAL PIPELINE

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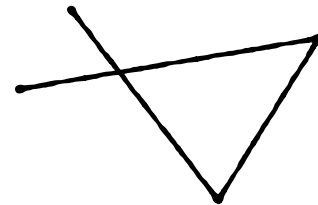
Present



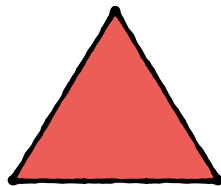
Point



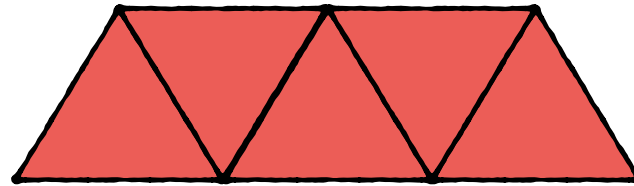
Line



Line strip



Triangle



Triangle strip



THE METAL PIPELINE

Setup

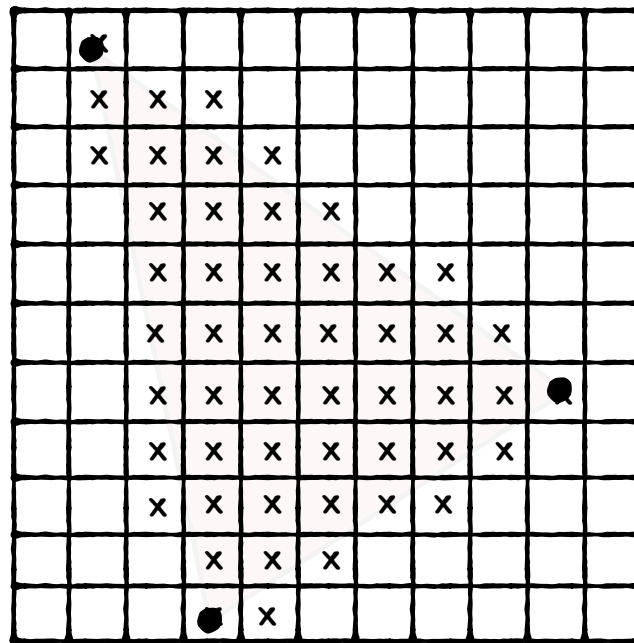
Vertex
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THE METAL PIPELINE

Setup

Vertex
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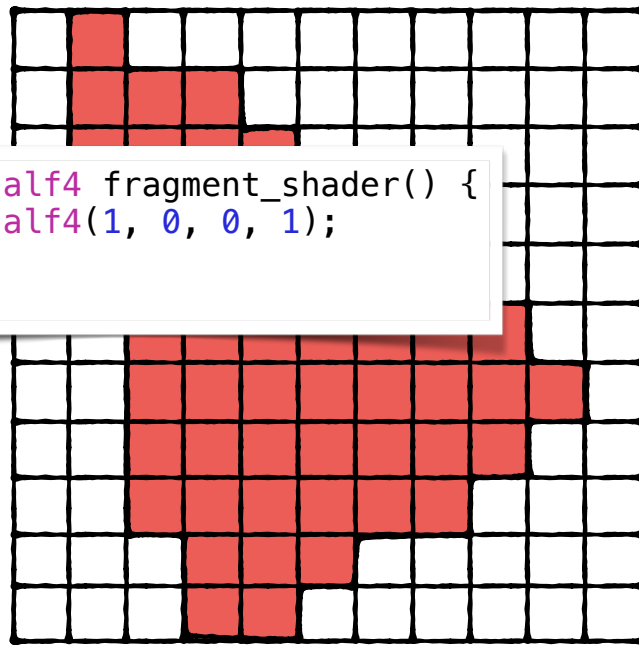
Primitive
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```
fragment half4 fragment_shader() {  
    return half4(1, 0, 0, 1);  
}
```



THE METAL PIPELINE

Setup

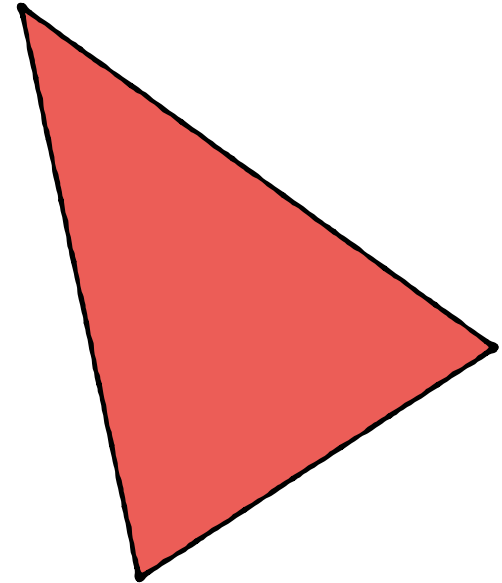
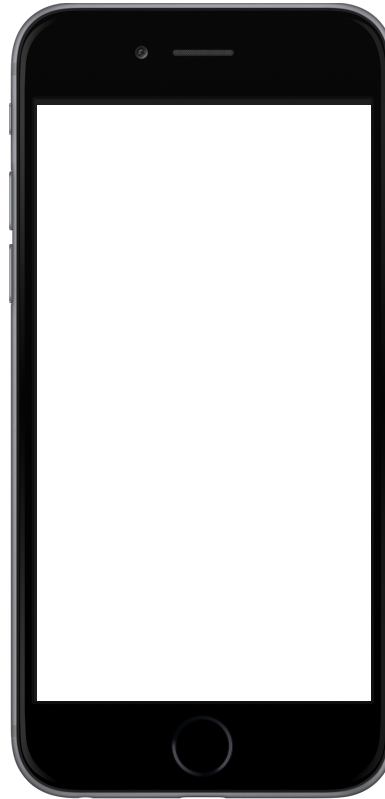
Vertex
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DEMO



CHALLENGE TIME!

