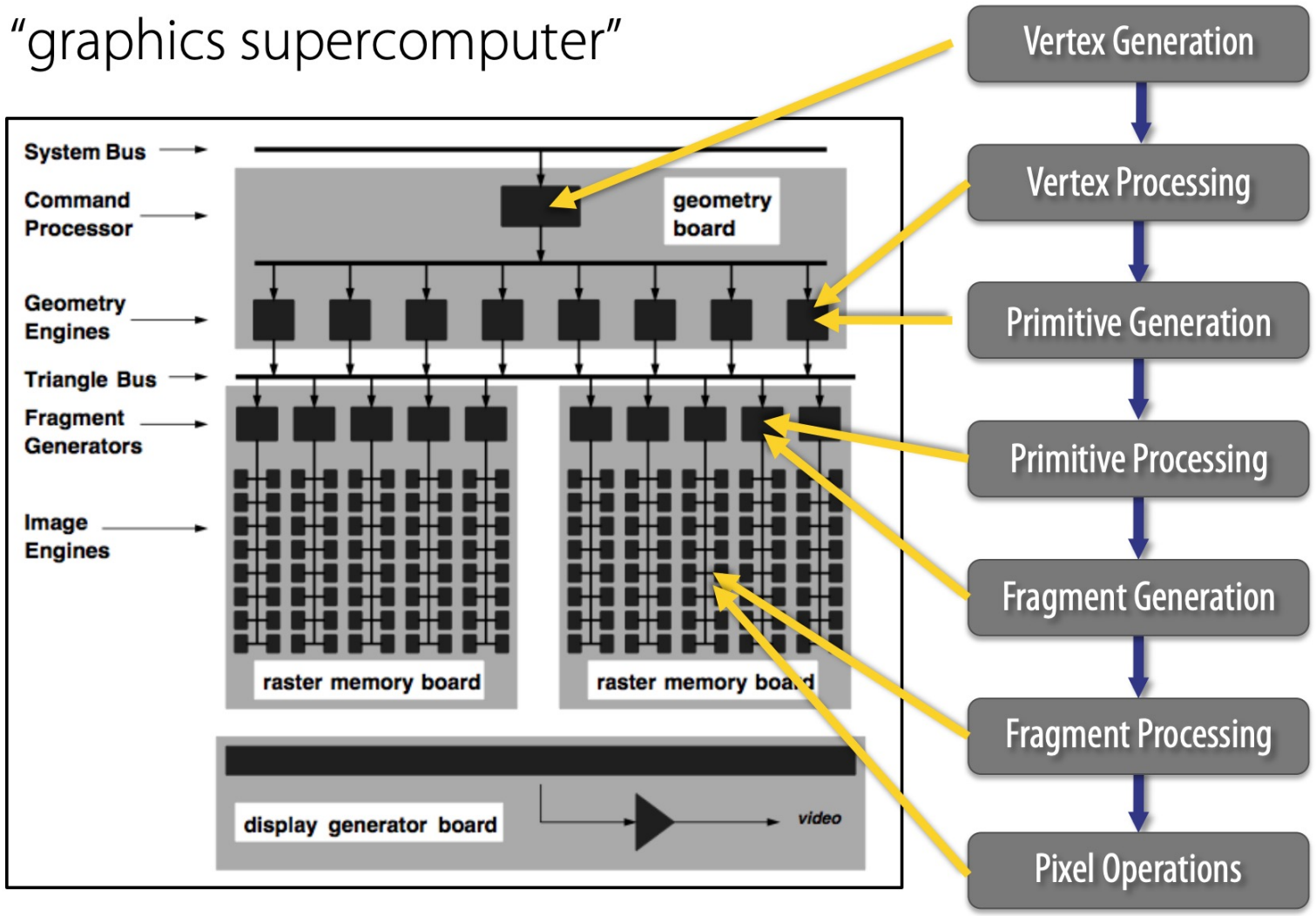
17 – gpu

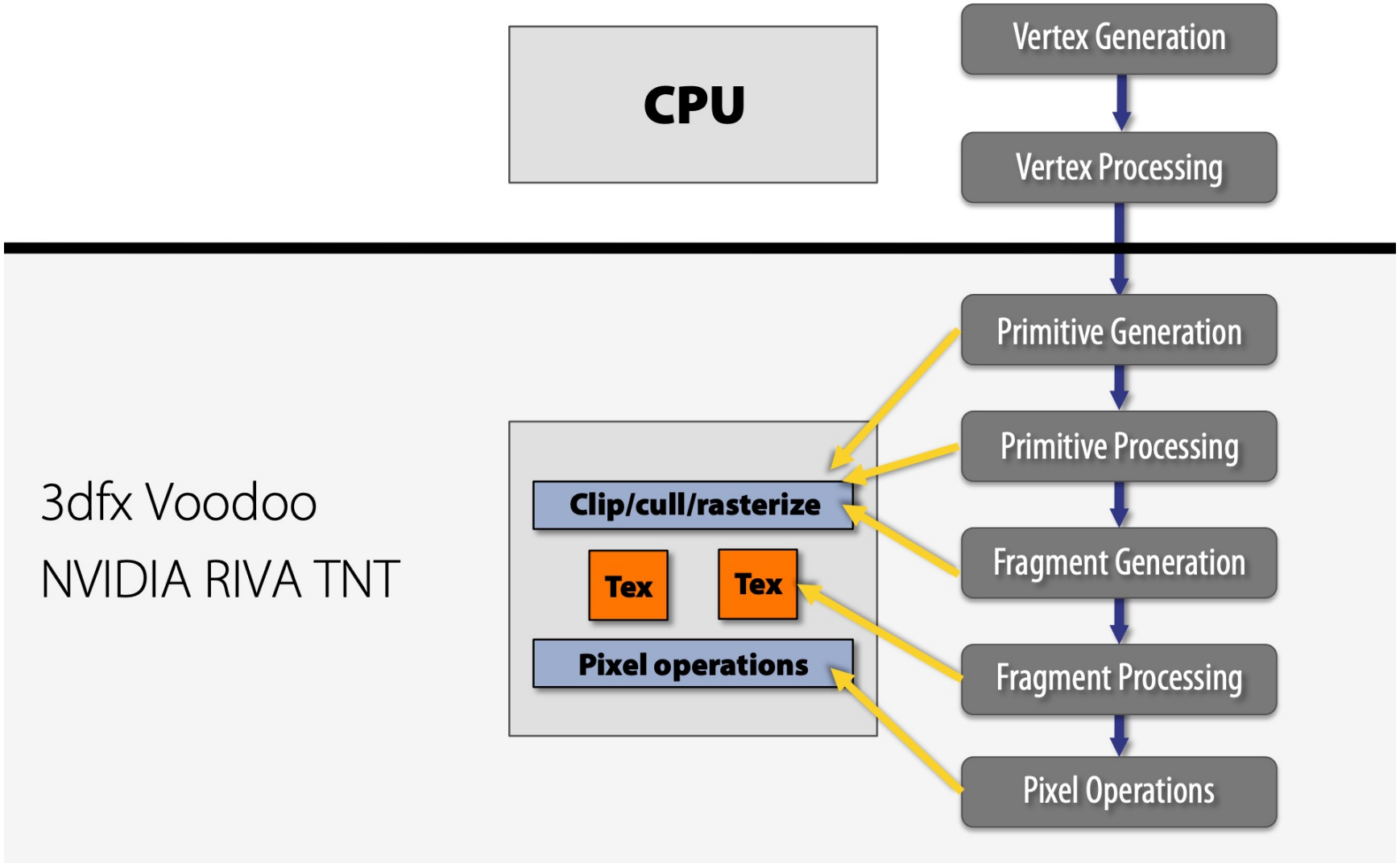
Silicon Graphics RealityEngine (1993)

"graphics supercomputer"



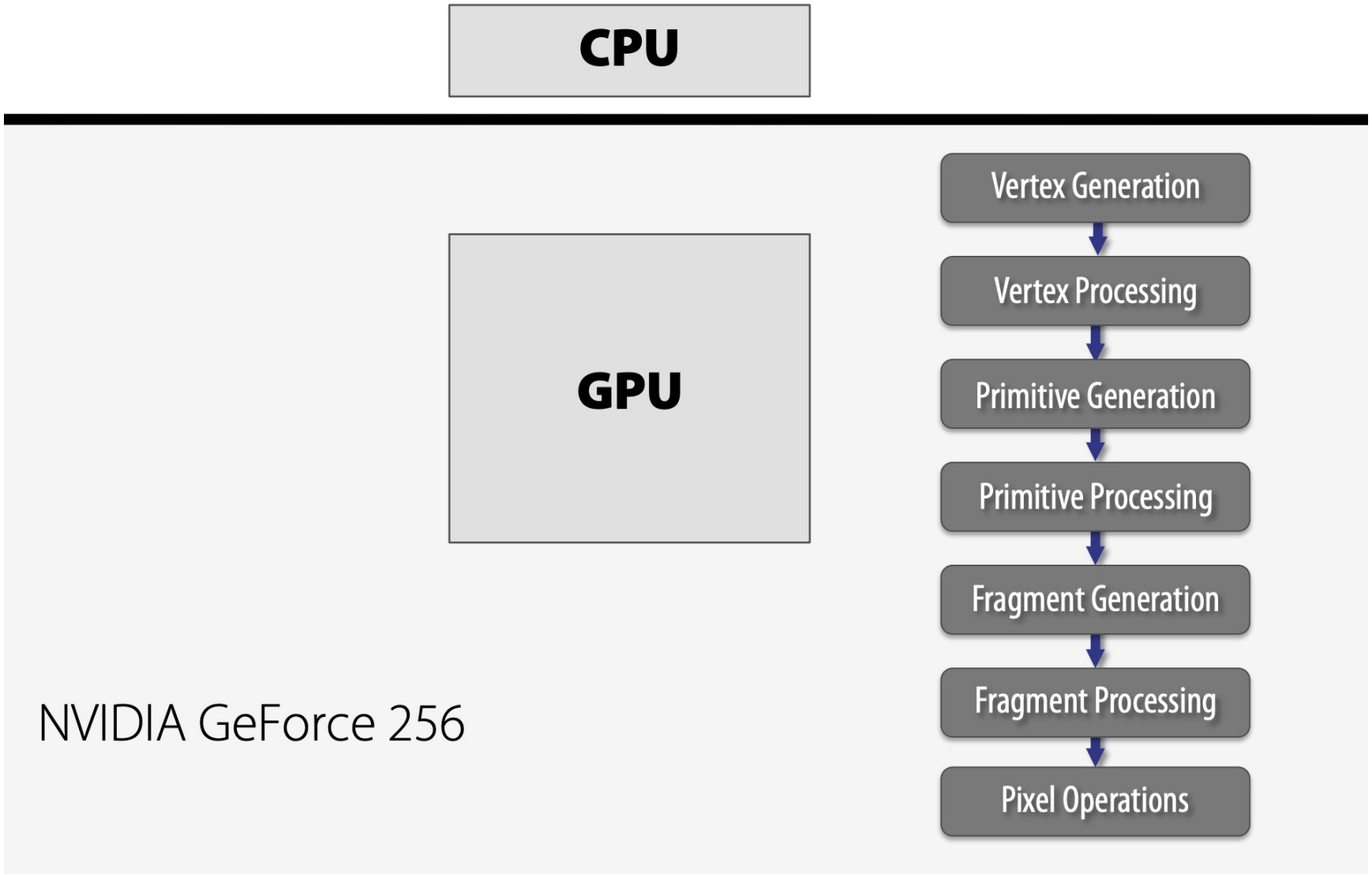
https://www.cs.cmu.edu/afs/cs/academic/class/15462-f11/www/lec_slides/lec19.pdf

Pre-1999 PC 3D graphics accelerator



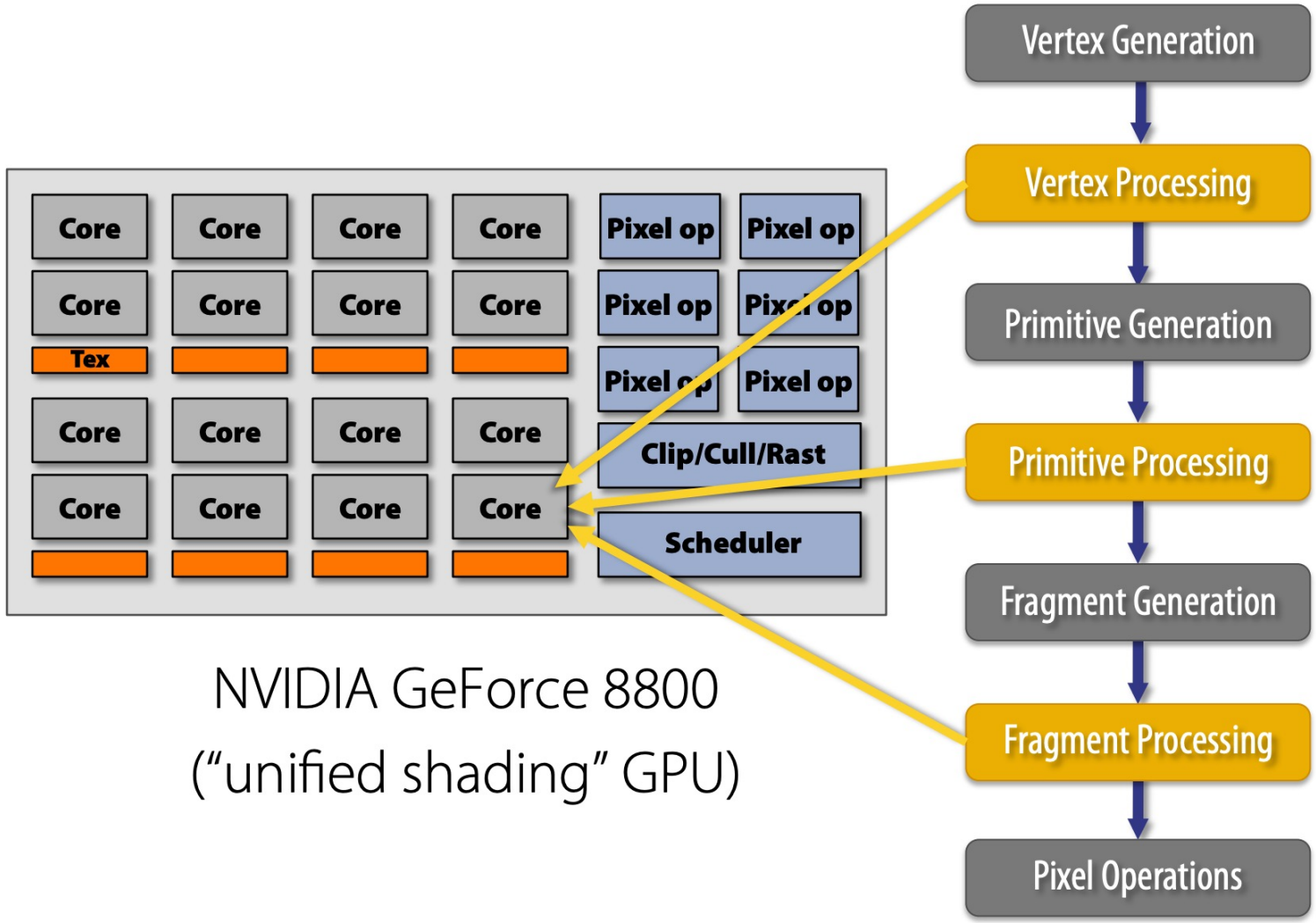
https://www.cs.cmu.edu/afs/cs/academic/class/15462-f11/www/lec_slides/lec19.pdf

GPU* circa 1999



https://www.cs.cmu.edu/afs/cs/academic/class/15462-f11/www/lec_slides/lec19.pdf

Direct3D 10 programmability: 2006



NVIDIA GeForce 8800
("unified shading" GPU)

https://www.cs.cmu.edu/afs/cs/academic/class/15462-f11/www/lec_slides/lec19.pdf

Nvidia GPUs

	2006 Tesla	2009 Fermi	2012 Kepler	2014 Pascal	2018 Turing	2020 Ampere
cores	128	512	2880	3584	4352	6912
transistors	681 million	3 billion	7.1 billion	12 billion	18.6 billion	54.2 billion
clock	1.5 Ghz	2 Ghz	0.89 GHz	1.4 / 1.6 GHz	1.3 / 1.8 GHz	1.5 / 1.7 GHz
perf (32)	576 Gflops	1.5 Tflops	5 Tflops	11.3 Tflops	14.2 Tflops	19.5 TFlops
fp16					30 Tflops	78 Tflops
tensor16					125 Tflops	312 Tflops
tensor32/64						156 / 19.5 Tflops
examples	Geforce 8 - 300	GeForce 400-500	GeForce 600-700	GTX 1000 series	GTX 1600 / RTX 2000	RTX 3000

Maxwell (2014) is GTX 750-980 series

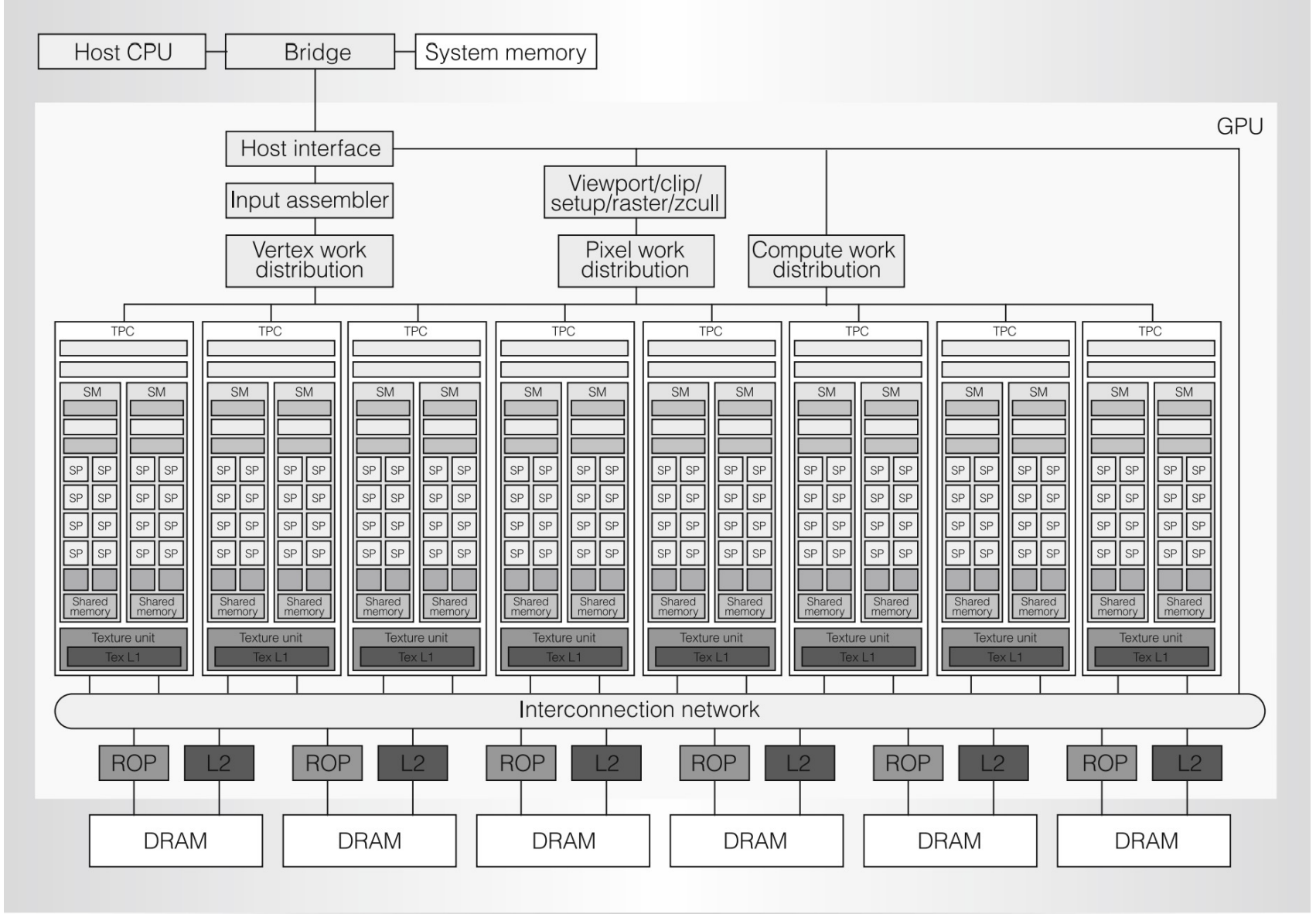


Figure 1. Tesla unified graphics and computing GPU architecture. TPC: texture/processor cluster; SM: streaming multiprocessor; SP: streaming processor; Tex: texture, ROP: raster operation processor.

https://ieeexplore.ieee.org/document/4523358

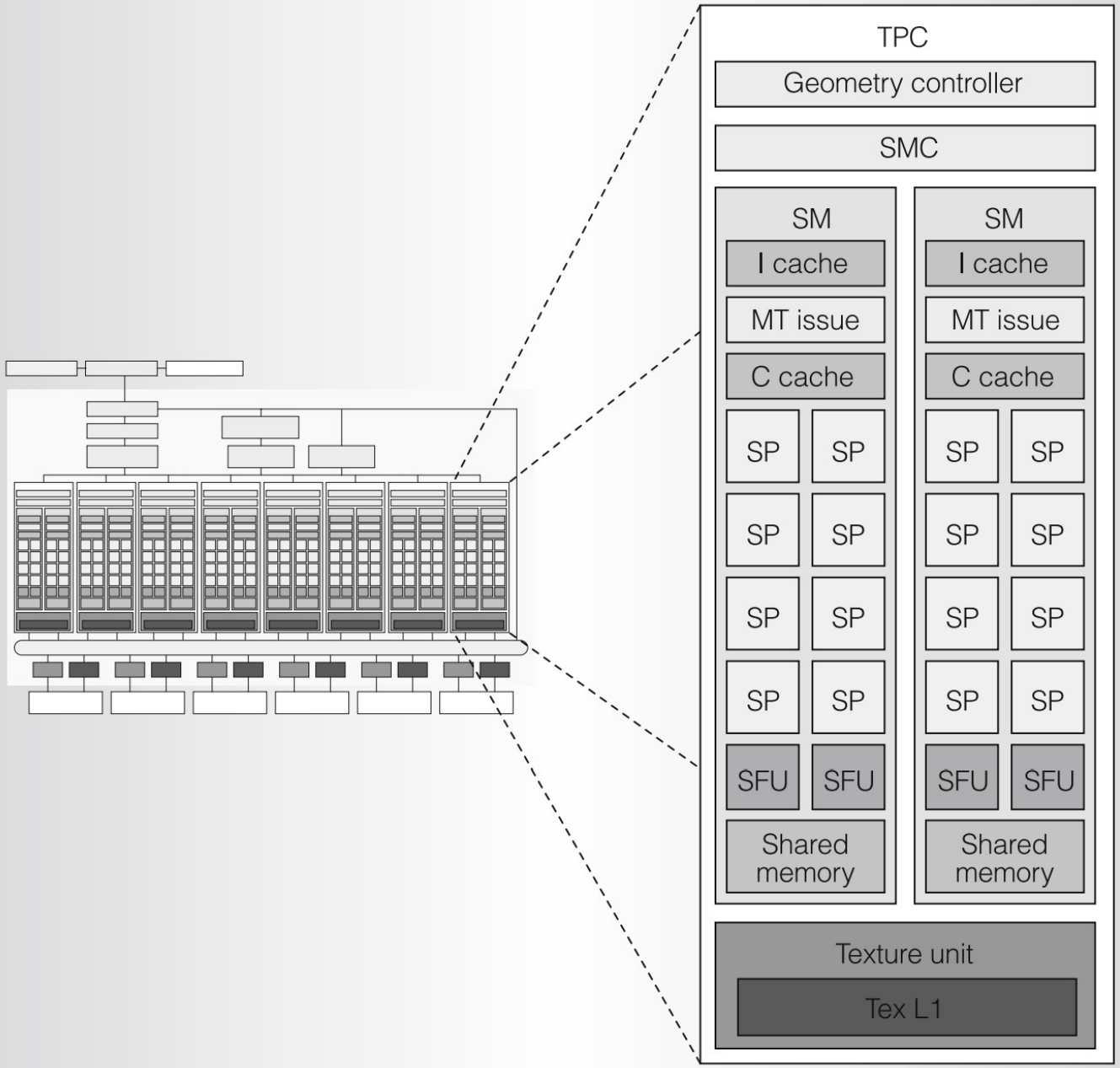


Figure 2. Texture/processor cluster (TPC).

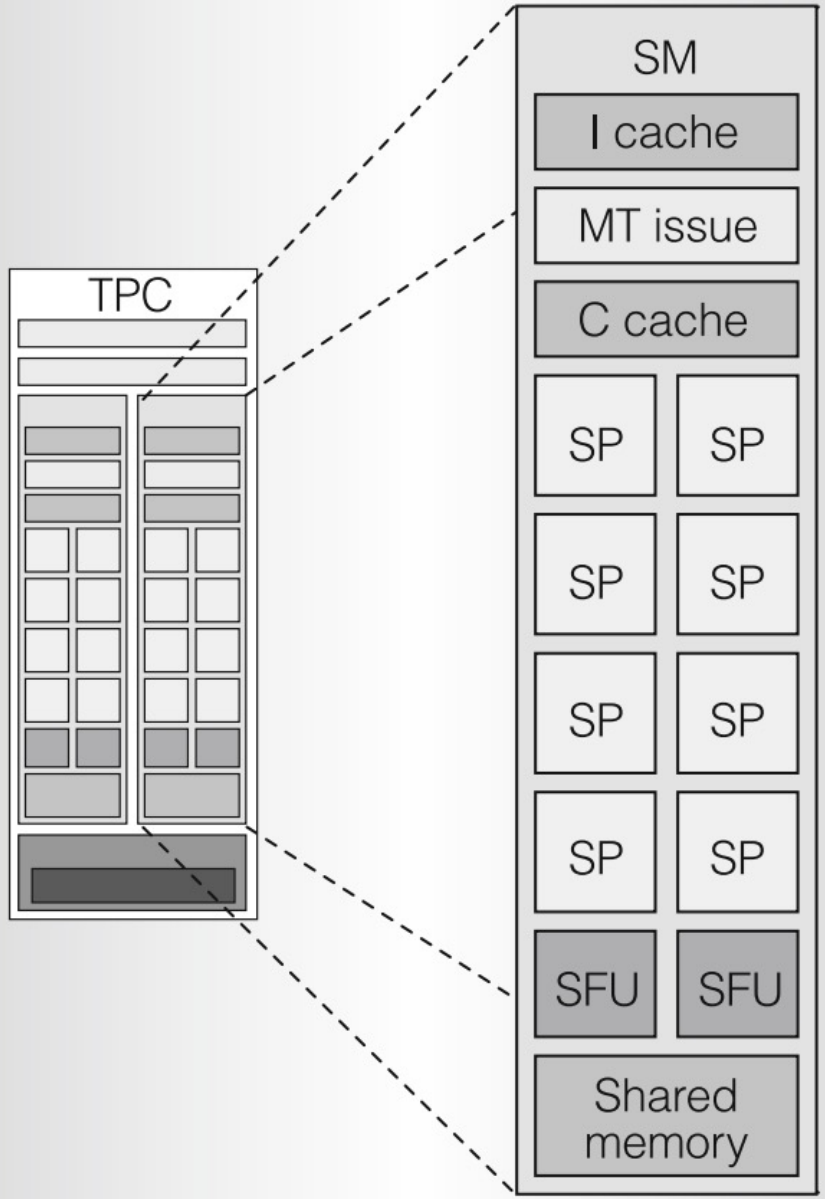
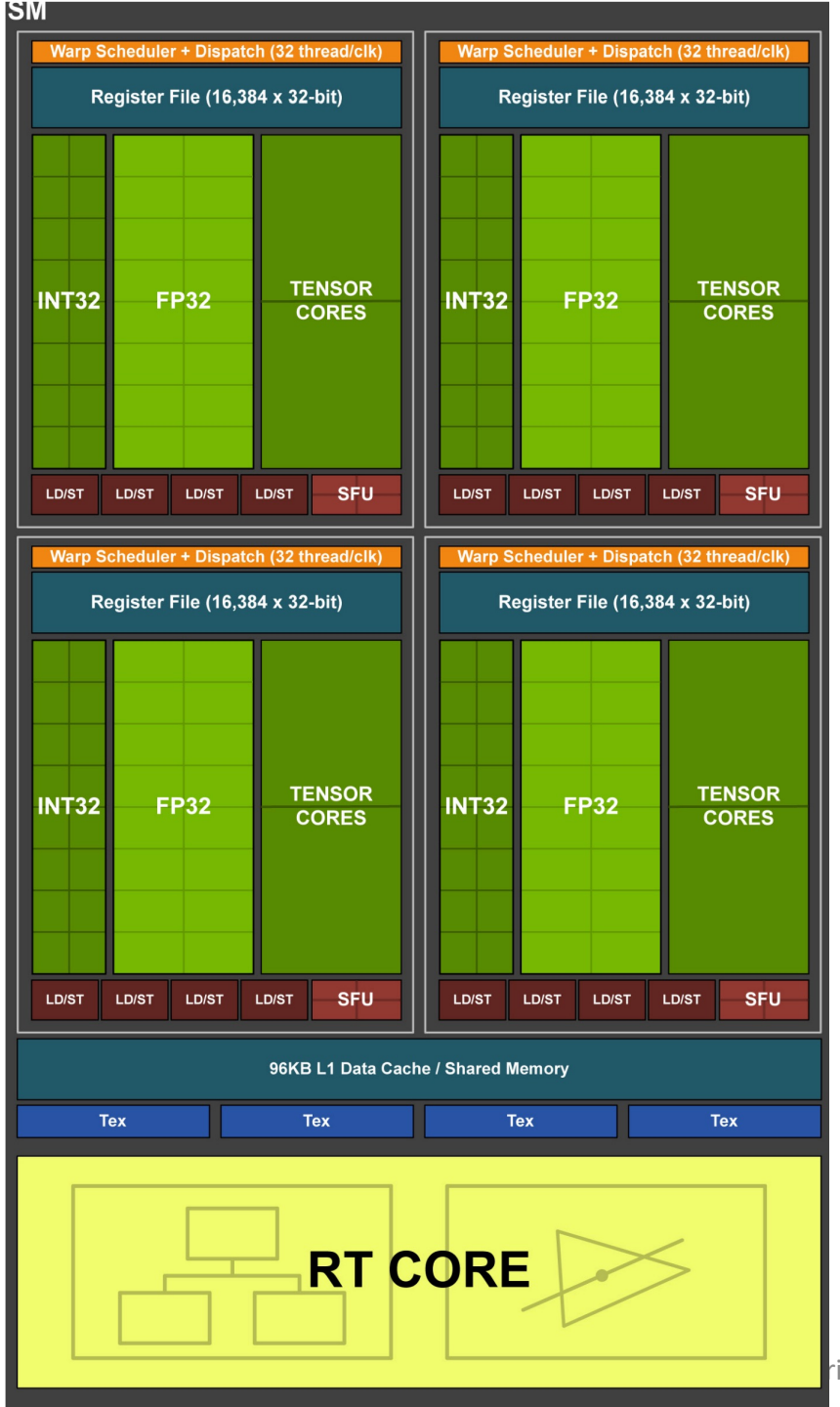


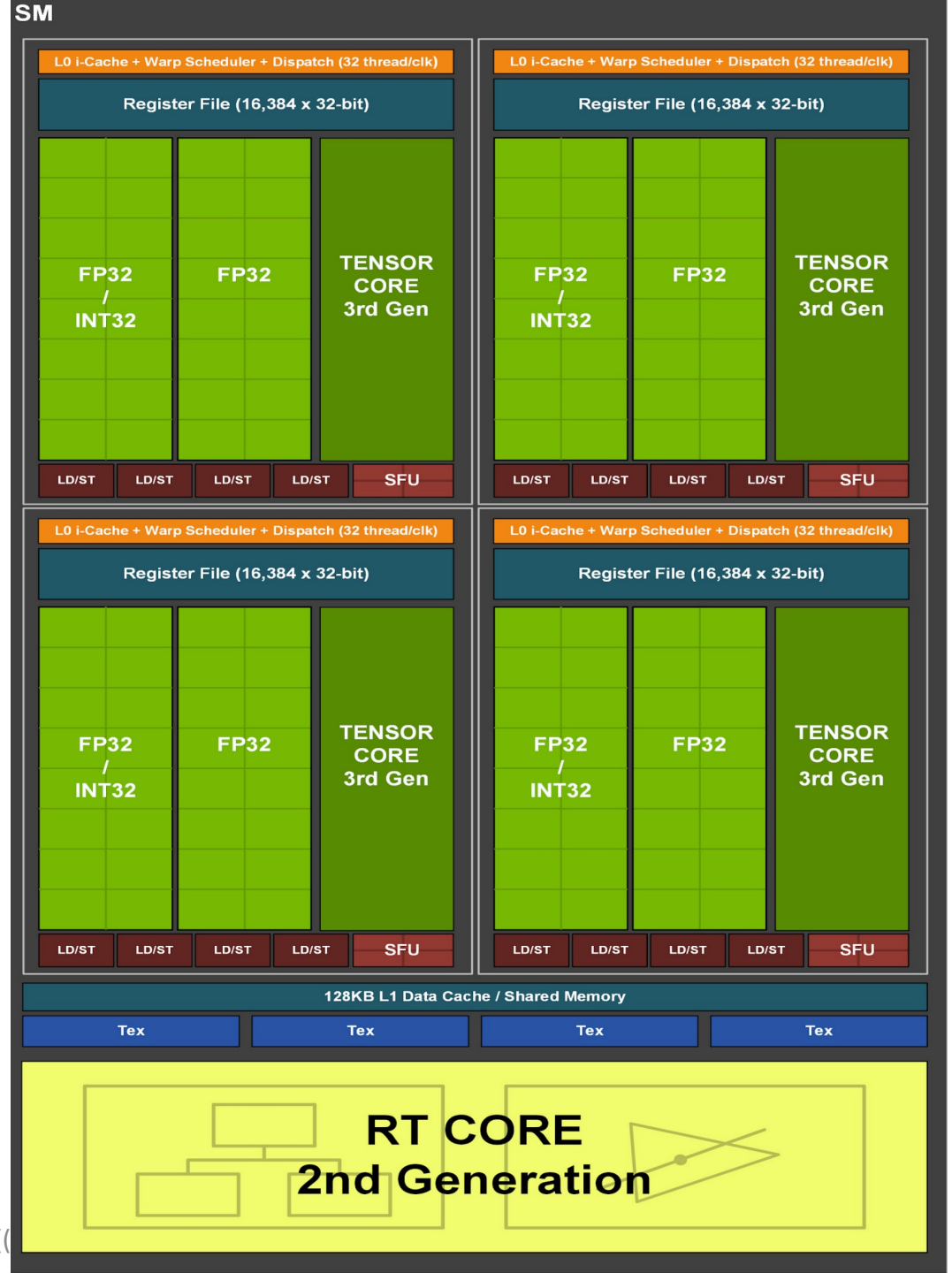
Figure 3. Streaming multiprocessor (SM).

https://images.nvidia.com/aem-dam/en-zz/Solutions/design-visualization/technologies/turing-architecture/NVIDIA-Turing-Architecture-Whitepaper.pdf

https://www.nvidia.com/content/PDF/nvidia-ampere-ga-102-gpu-architecture-whitepaper-v2.pdf



Turing
vs
Ampere



Turing Chip