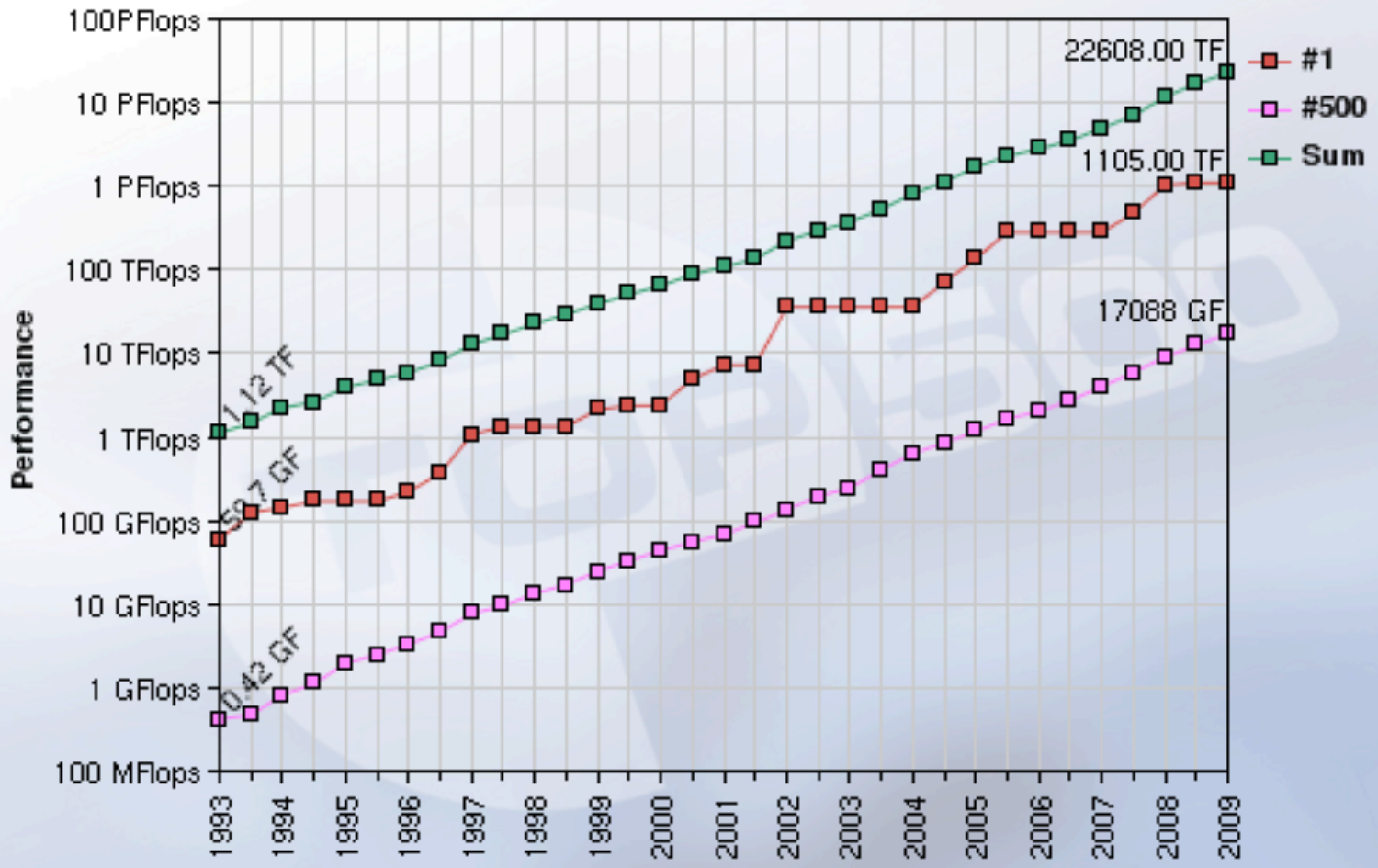
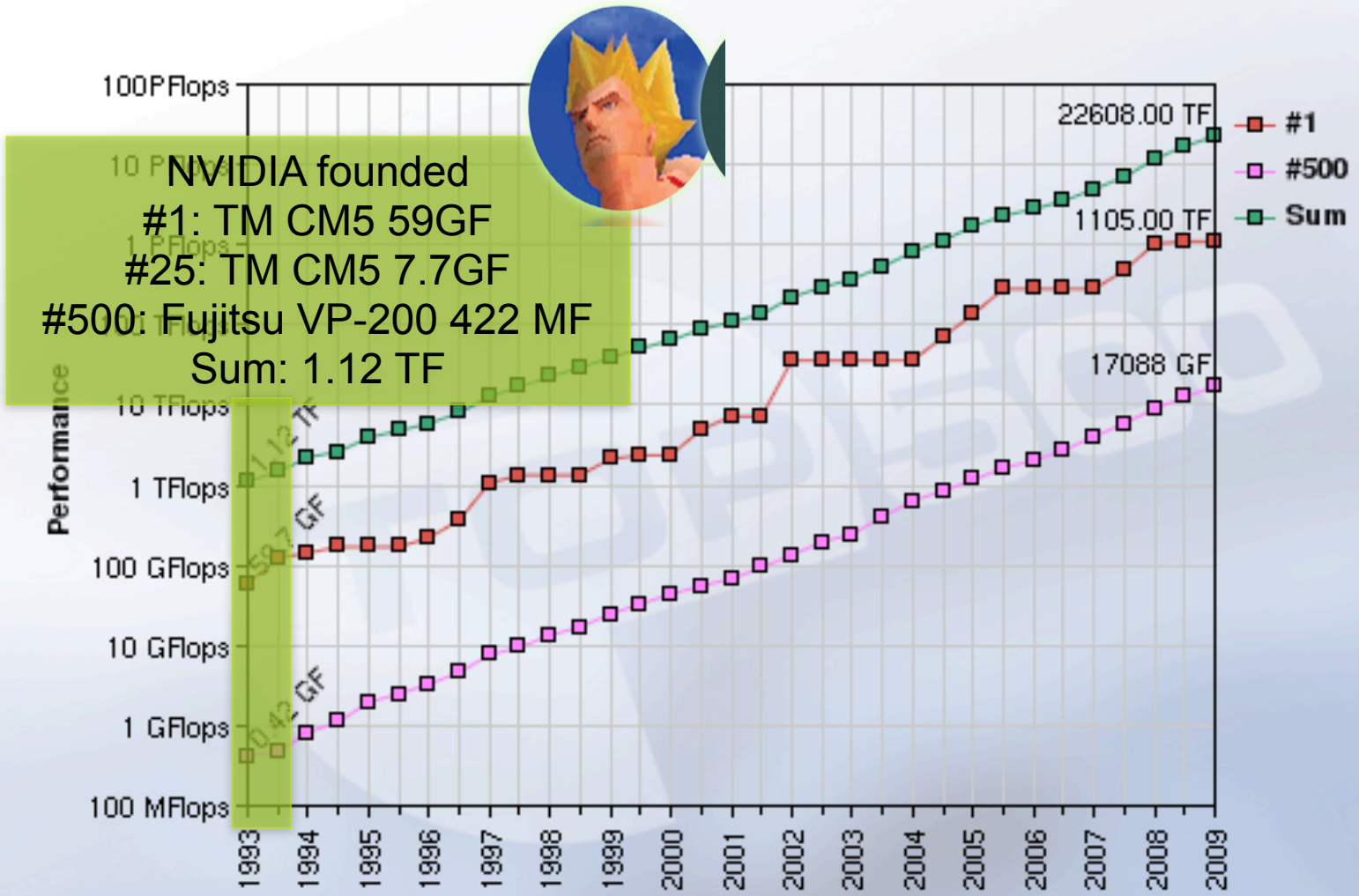
Performance Development



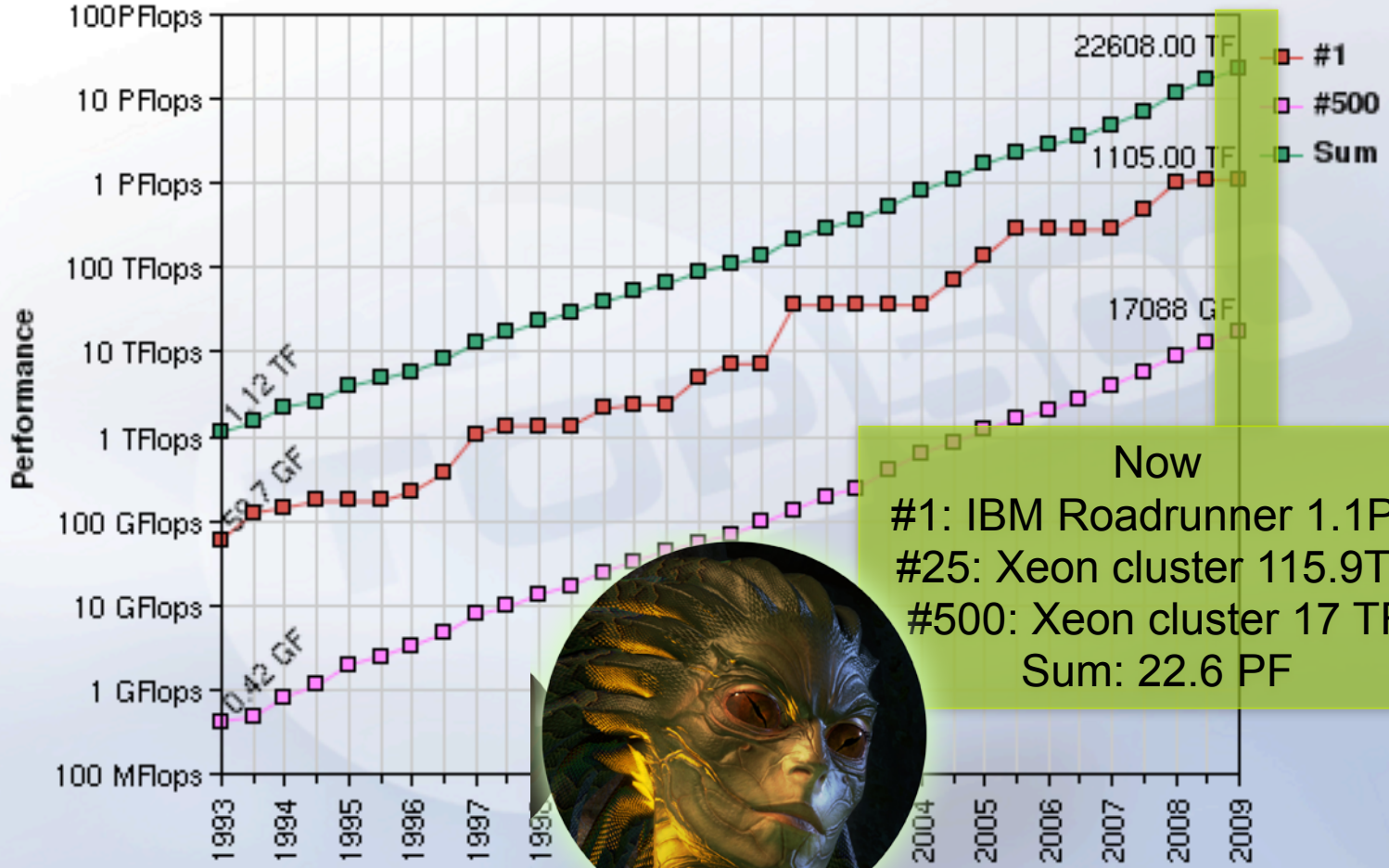
19/06/2009 http://www.top500.org/

Performance Development



19/06/2009 http://www.top500.org/

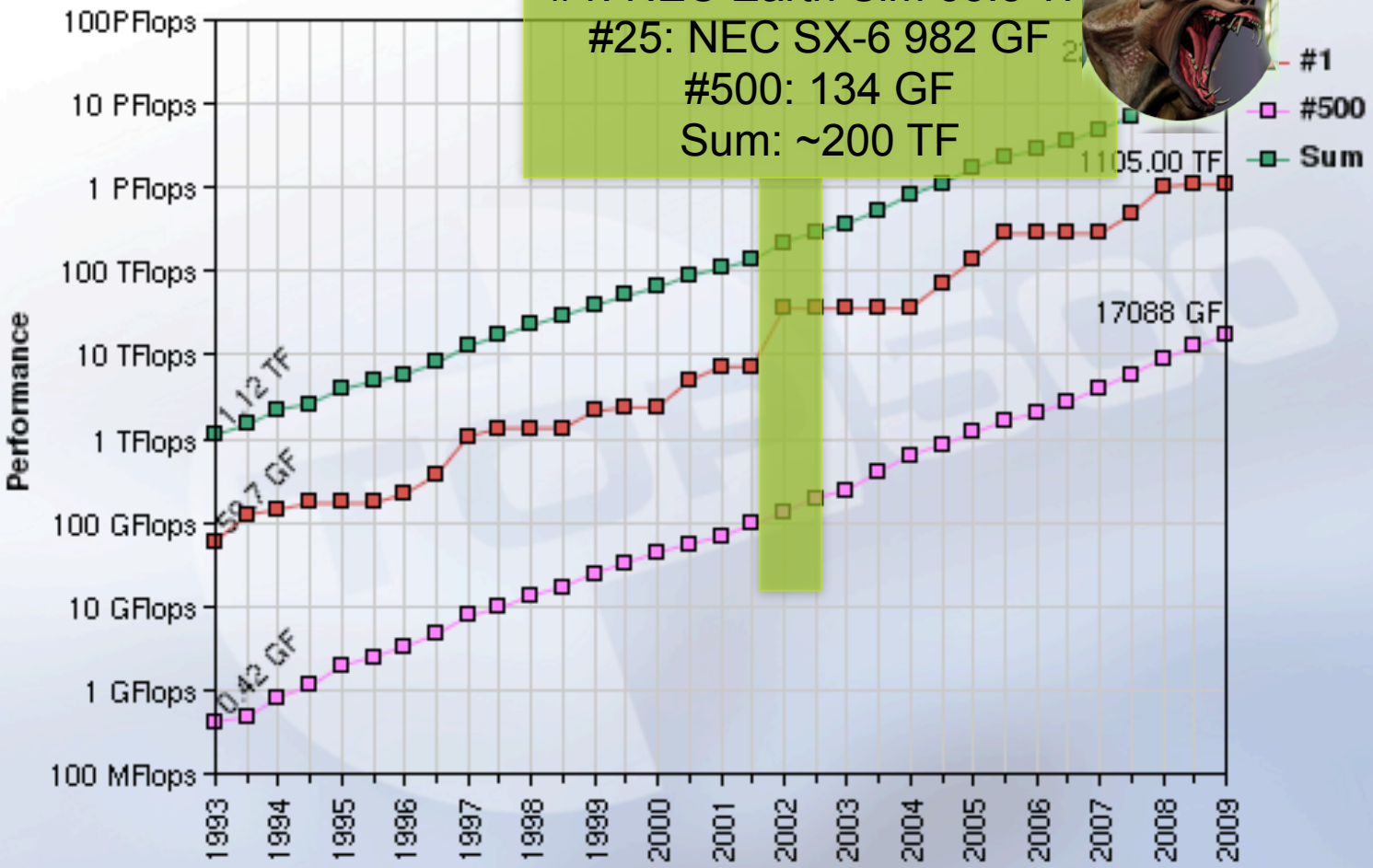
Performance Development



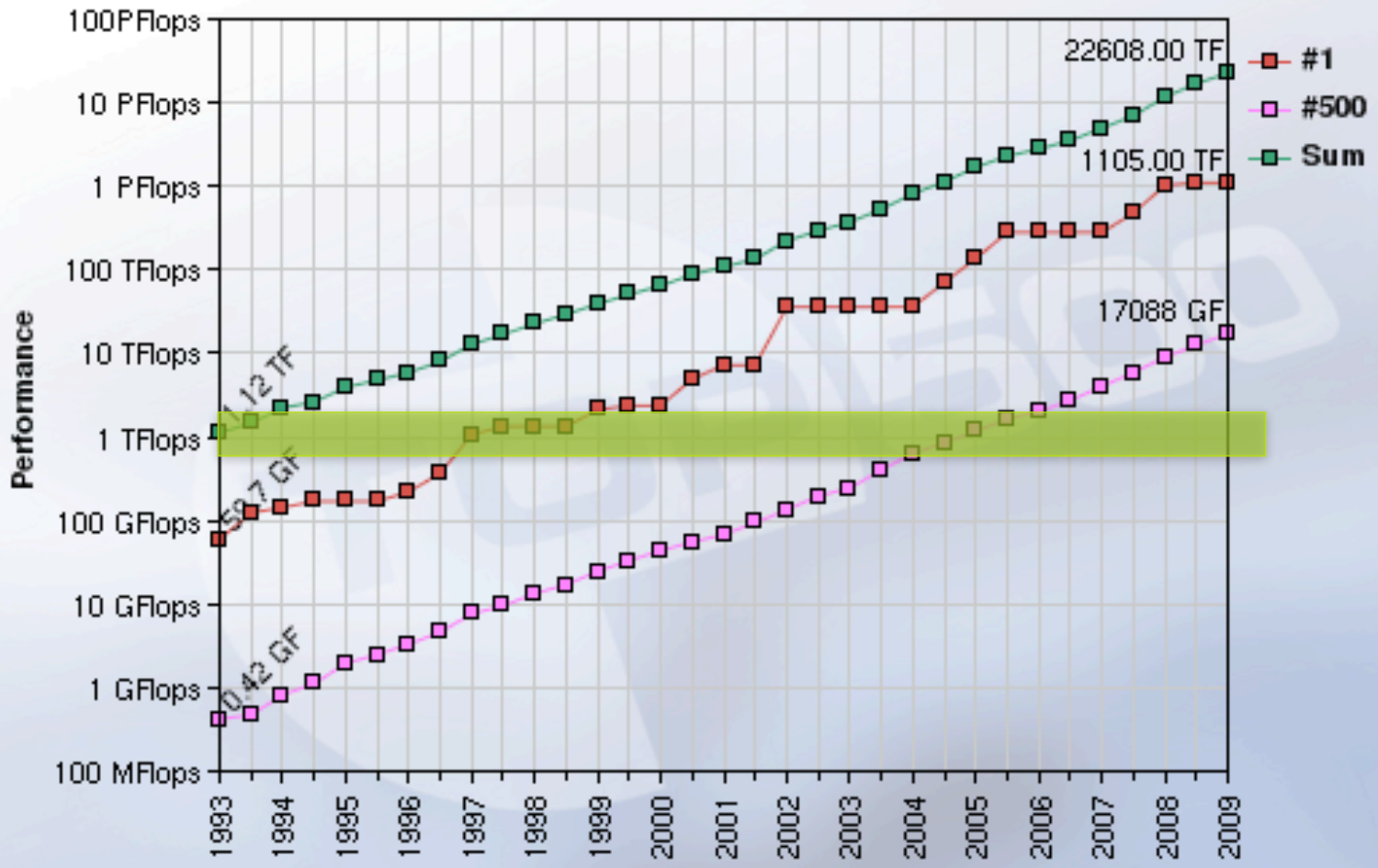
Now
#1: IBM Roadrunner 1.1PF
#25: Xeon cluster 115.9TF
#500: Xeon cluster 17 TF
Sum: 22.6 PF

Performance Development

7 years ago
#1: NEC Earth Sim 35.8 TF
#25: NEC SX-6 982 GF
#500: 134 GF
Sum: ~200 TF

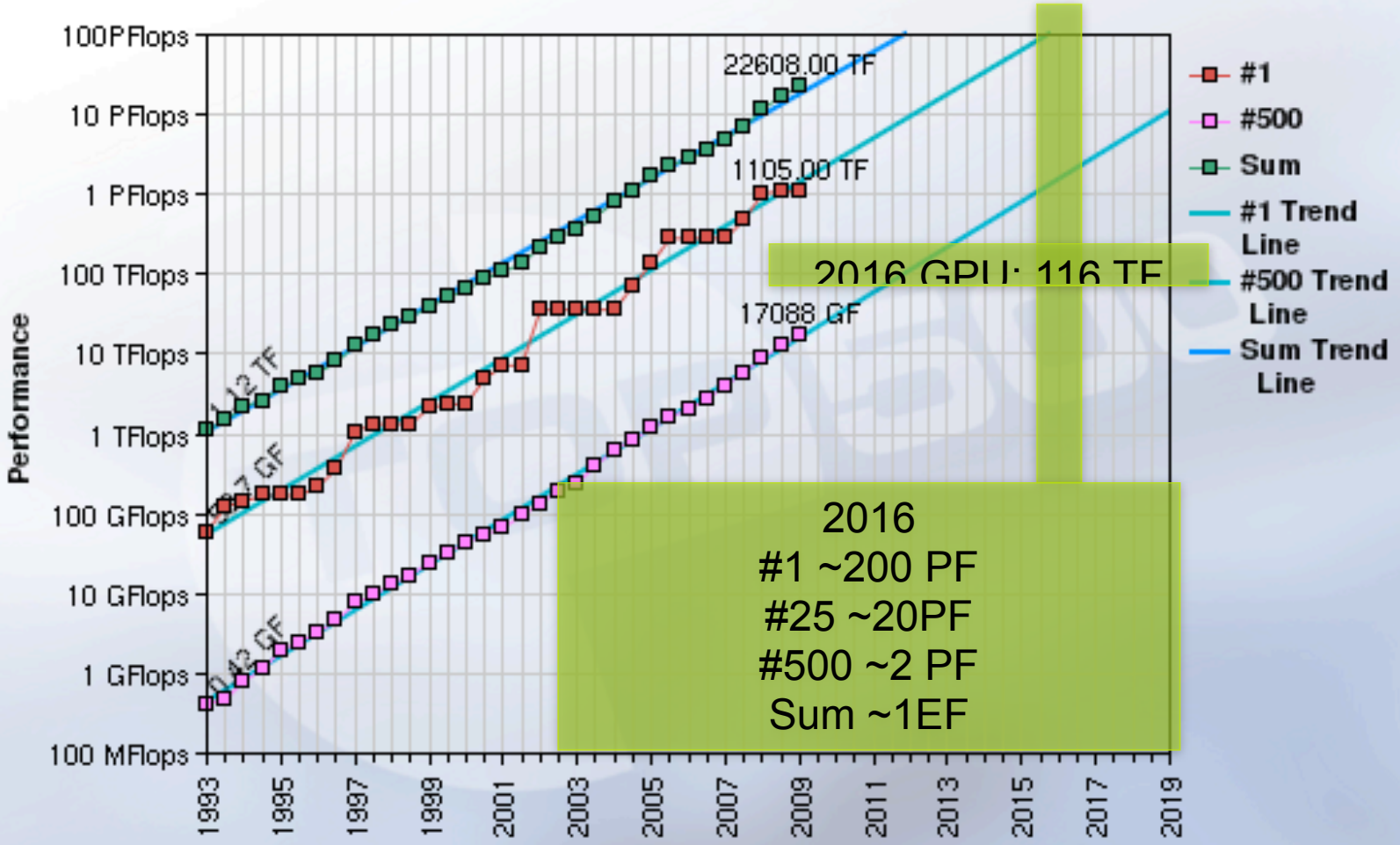


Performance Development



19/06/2009 http://www.top500.org/

Projected Performance Development



2016 GPU: 116 TF

2016
#1 ~200 PF
#25 ~20PF
#500 ~2 PF
Sum ~1EF

Why is GFX the same as HPC?

- Driven by the same issues:
  - Power constrained (200 W vs 2 MW)
  - Space constrained
  - Amenable to high degrees of parallelism
  - Developer time constrained
  - Motivated users
- Same companies in both markets

Rasterization will be dead in 7 years

- Polygon size going down
  - Rasterizer inefficient
- Shading dominates anyway
  - Overdraw hurts
- Passes going up
  - 100s in modern game
- Art cost going up exponentially
  - Unsustainable

- Maybe still used in offline rendering at some studios

REYES will be dead in 7 years

- Inherits many problems from rasterization
  - Still needs many passes
  - No GI effects
- Substantial redundant computation
  - Tessellation per pass
  - Overmodeled -> overshaded
- Adds geometric richness, but does it really reduce artist time?
- Possible short term academic interest

Ray tracing will be dead in 7 years

- Not power efficient
- High cost variability makes framerate difficult to predict
- Unsolved/partially solved problems
  - Aliasing
  - Displacements
  - Dynamic / deforming scenes
  - Efficient SIMD
- Not as parallel as you think

Now what?

- Claim 1: Algorithms of the future will be a combination of ray tracing, rasterization, and REYES
  - Open question: will it be a blend of algorithms or a unification?
- Claim 2: Algorithmic improvements as important as HW improvements
  - Open question: which algorithms
- Claim 3: Software will play an increasing role
  - Open question: how will hardware companies fit this into business model
- Claim 4: The brave will get there first