Milky Way 2A

China Upgraded MilkyWay 2 Supercomputer

- What is Supercomputer
- Previous version of MilkyWay
- MilkyWay 2A specs
- Usage & Challenges

What is Supercomputer

computer with a high level of computing performance compared to a general-purpose computer.

Performance measurement – floating-point operations per second

Name	MilkyWay2A	Intel Core i7 – 7700K
Computing Power	9.497×10^{16} floating-point operations/s	5.1×10^{9} floating-point operations/s
Power Consumption	18×106W (5.28×10^{9} flops/W)	91W (5.26×10^{7} flops/W)

Previous Version

Milky Way

- 4.7×10^{15} floating-point operations/s
- Oct 2009
- Rank 48 (June 2017)
- National University of Defense Technology
  Changsha, China

Milky Way 2

- 5.49×10^{16} floating-point operations/s
- May 2013
- Rank 2 (June 2017)
- National University of Defense Technology
  Changsha, China
  (cause the whole school black out)
- National Supercomputer Center
  Guangzhou, China
  (Sun Yat-Sen University, Zhongshan University)

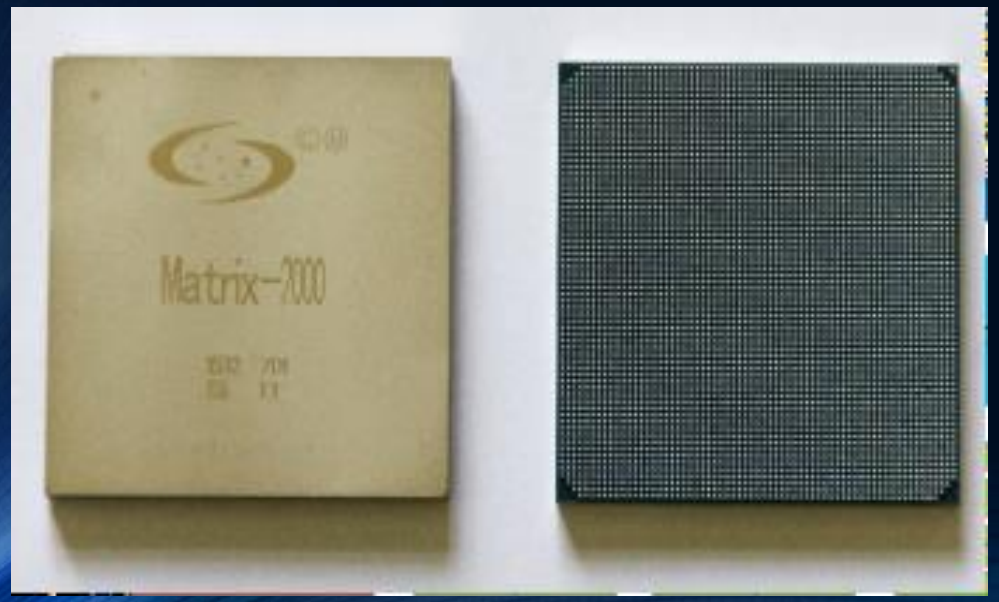
MilkyWay 2A Specs

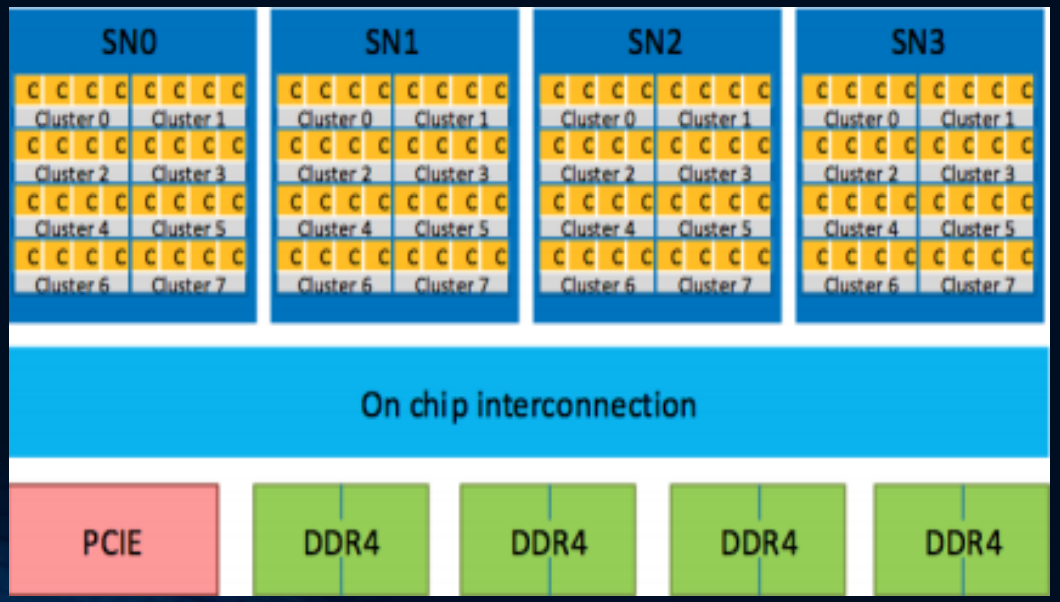
Upgrades 1

Intel Xeon Phi Knights Corner accelerators to Matrix-2000 accelerators

(February 2015, US Department of Commerce banned export)

Accelerator — computer hardware used to perform some functions more efficiently than is possible in a more general-purpose CPU
(example Graphic Card)





MilkyWay 2A Specs

Upgrades 2 & 3

- 16000 nodes to 17792 nodes
  - each node
    - uses two matrix-2000 accelerators and two Intel Core Ivy Bridge CPUs (12 cores clocked at 2.2 GHz)
    - 5.3376×10^{12} flops
  - 35,584 Ivy Bridge CPUs + 35,584 Matrix-2000 accelerators
    - total 4,981,760 compute cores
- 1.4PB DDR4 2400MHz memory to 3,4 PB DDR4 2400MHz memory

Use Cases of MilkyWay 2

Comac C919 Flight Aerodynamic outflow

Organic small compounds’ binding affinity for Shanghai Institute of Materia Medica

Guangzhou electronic government management system

Challenges

Difficult to use

"the function of the supercomputer is still way behind, some users would need years or even a decade to write the necessary code"

Chi Xuebin, deputy director of the Computer Network and Information Center

Low efficiency

Rmax(max calculation power)/Rpeak(theoretical calculation power)

- Tianhe 2A – 64.0%
- Piz Daint (rank 3)–77.4%
- Titan (rank 4) – 64.9%
- Sequoia (rank 5) – 85.3%

Oversupply

Building objective is always the rank

Built by supercomputer center sell calculation to users, however potential user:

- Research University—have own supercomputers, impossible to go all the way to Guangzhou
- Military — Security of open computer center
- Industries — slow software greatly reduce actual problem-solving ability