Supercomputing examples

#1 Supercomputer in the world

The **Sunway TaihuLight** is a Chinese supercomputer which, as of November 2016, is **ranked #1** in the TOP500 list (The TOP500 project ranks and details the 500 most powerful non-distributed computer systems in the world), as the fastest supercomputer in the world, with a LINPACK benchmark rating of **93 petaflops**. Let's first watch a documentary video on this system:

A documentary on the Sunway Taihulight: world's fastest supercomputer 2016

It was designed by the National Research Center of Parallel Computer Engineering & Technology and is located at the National Supercomputing Center in Wuxi in the city of Wuxi, in Jiangsu province, China. This cluster operates using a Linux variant called Sunwat RaiseOS. It has a total of **40,960** manycore 64-bit RISC processor **nodes**.Each processor chip contains 256

processing cores, and an additional four auxiliary cores for system

management for a total of **10,649,600 CPU cores** across the entire system. It has a total of 1.31 PB of internal memory and requires 15,371.00 kW of power to operate.

Future Supercomputers - 150-300 PFlops

The Summit is a supercomputer being developed by IBM for use at Oak Ridge National Laboratory. The system will be powered by IBM's POWER9 CPUs and Nvidia Volta GPUs. The system is targeting **150 - 300 PFLOPS** of performance at 10 MW of power. The computer will be finished in 2017, and moved to Oak Ridge in 2018 where it will replace its current Titan supercomputer. It will have ~**4600 compute nodes**, with 2 x IBM Power9 CPUs, 6 x Nvidia Volta GPUs and 512 GB internal memory pre node. Finanly, the whole cluster will have a total **10 PB** of memory.

Top supercomputing facilities at renowned Universities around the world

Let's now know about some more examples of supercomputers that are readily available for the researchers at universities (know more)

Stampede, Texas Advanced Computing Center/University of Texas

This computer has a maximum speed of 5,168 teraflops and is ranked seventh on the latest TOP500 list, in addition to holding the No. 52 spot on Green500's list. The university also has the TOP500's 153rd ranked computer: Lonestar 4, with a top speed of 251 teraflops. Among the research projects utilizing Stampede is the study of graphene, an excellent conductor of electricity and heat that might emerge as a replacement for silicon.

Conte, Purdue University

A year ago, Purdue University built Conte, a supercomputer with a sustained measured maximum speed of 943 teraflops. Now it has a speed of more than 977 teraflops, and ranks No. 33 on the TOP500 list and No. 39 on the Green500 list. The computer is used by faculty conducting research on, among other things, atmospheric gases that cause global warming, atom-scale models related to batteries, and future computer processors, high-resolution weather forecasts, and viruses. In June 2013, Purdue claimed Conte was the most

powerful university supercomputer, ranked 28th on the TOP500 list.

Kraken, National Institute for Computational Sciences/University of Tennessee

At 919 teraflops, this computer is ranked No. 35 by TOP500. Kraken, which shares its name with a legendary giant squid, has been used to simulate earthquake scenarios, to help understand black hole events, and to analyze how protoplanetary turbulence leads to the creation of stars and planets.

AMOS, Rensselaer Polytechnic Institute

The RPI computer is ranked 38th in the world at 894 teraflops, and comes in at No. 21 on the Green500 list. The school upgraded from an IBM BlueGene/L to a BlueGene/Q in October 2013. Among the projects run on the computer are models that show how fluids interact with wind turbine blades, to help develop turbines that generate more power.

Big Red II, Indiana University

Big Red II is No. 53 on the TOP500 list, with a speed of 597 teraflops. Big Red II is 25 times faster than its predecessor, and it was planned to be used for research in the areas of, among other things, mining social media data for economic predictions, human genome sets, weather, blood circulation, large-scale molecular dynamics, aerospace engineering, and microbe behavior. It comes in 48th on the Green 500 list.

HPCC, University of Southern California

Ranked 60th with a top speed of 531 teraflops, HPCC is also No. 18 on the Green500 list. The computer supports more than 110 research groups, including those focused on epigenetics, geophysics, materials science, engineering, natural language translation, and health sciences.

Palmetto2, Clemson University

At a speed of 397 teraflops, Palmetto — called a "pioneering example of a computer condominium" by Clemson — is the Top500's No. 81. Its computing resources are administered and supported by IT staff and used by researchers, students, and faculty from more than 40 academic departments. Palmetto debuted in 2008 at a speed of 31 teraflops.

COSMOS Supercomputer, Cambridge University

The Cambridge High Performance Computing Cluster Darwin was the largest academic supercomputer in the UK at installation in November 2006,

providing 50% more performance than any other academic machine in the UK. In October 2010 the system was upgraded by replacing 256 Woodcrest cores and 512 GB of memory with 1536 Westmere cores and 4608 GB of memory, connected via QDR Infiniband (3200 MB/s bandwidth and less than one microsecond latency). Over the period of March-June 2012, a major upgrade was undertaken in which the old Woodcrest nodes were decommissioned and replaced by 9600 2.60GHz Intel Sandy Bridge cores (600 nodes, 64GB of RAM per node, connected by Mellanox FDR Infiniband). This new system achieved a sustained Linpack performance of 183.379 TFlops (90.6% of peak), earning position 93 on the June 2012 Top500 list.

Shaheen, KAUST

Shaheen is a supercomputer owned and operated by King Abdullah University of Science and Technology (KAUST). It consists primarily of a 36-cabinet Cray XC40 supercomputer. Built in partnership with Cray, Shaheen is intended to enable KAUST Faculty and Partners to research both large and small-scale projects, from inception to realization. The second generation of Shaheen has the following specifications: Cray XC40 supercomputer with DataWarp technology, 5.536 Petaflops of sustained LINPACK performance, 7.2 Petaflops of theoretical peak performance, 790 TB of total memory and 197,568 processor cores (Haswell)