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Title: “Fugaku: Japan’s new world’s most powerful supercomputer which will be used for COVID-19 research”

Kobe, Japan: Top 500 list of supercomputers which was previously ruled by US and China has now been taken over by a Japanese supercomputer named Fugaku installed at RIKEN center for Computational Science.

Fugaku was developed by RIKEN and Fujitsu and was a decade long development by thousands of developers with investment of around a billion dollars by Japanese government. The supercomputer which will be operational from fiscal year 2021 was put into operation in June 2020 and demonstrated the Linpack performance of 415.53 petaflops.

//FLOP/S stand for floating point operations per second, one petaflop is computing speed equal to thousand million million (10^15) or quadrillion floating point operations per second. That is one calculation every second for 31,688,765 years. For 415.53 petaflops it is one calculation per second for 13.2 billion years.

//The first supercomputer made was ‘CDC 6600’ which was world’s fastest supercomputer from 1964 to 1969. It was manufactured by Control Data Corporation. It used single core processor and could perform up to three megaflops which is a really far stretch from today’s supercomputer. In fact current small mobile devices perform 10,000 times faster than the CDC 6600.

Fugaku’s predecessor was ‘Summit’ which tested 148.6 on the LINPACK benchmark which is 2.8 lower than that of Fugaku. Summit was developed by IBM and NVIDIA with a budget of around 200 million US dollars compared to the Fugaku’s budget of around 1 billion dollars. Summit is currently being used at Oak Ridge National Laboratory in US. It is also the first supercomputer to reach exaflop (quintillion operation per second) speed. Fujitsu uses 158,976 Fujitsu’s A64FX CPUs. Each one of A64FX is a 48-core Arm chip which offers a peak double precision (64 bit) floating point operations performance of over 2.7 teraflops. Thus it uses 7.3 million cores compared to Summit’s 2.4 million.

Fugaku’s arrival on top of Top500 list of supercomputers is first time an ARM (Advanced Reduced Instruction Set Computing Machine) supercomputer has also taken the lead in the list. ARM processors are cheaper, use less power and generate less heat and are relegated to the mobile word.

Along with LINPACK benchmark Fuagku scored top on four supercomputers benchmark. Other three are HPCG, a ranking of supercomputers running real-world applications, Graph 500 which profiles data-intensive tasks and HPL-AI benchmark, designed to measure HPC performance using machine/deep learning workloads.

"The supercomputer Fugaku illustrates a dramatic shift in the type of compute that has been traditionally used in these powerful machines, and it is proof of the innovation that can happen with flexible computing solutions driven by a strong ecosystem," Rene Haas, president of IPG at Arm, said.

"For Arm, this achievement showcases the power efficiency, performance and scalability of our compute platform, which spans from smartphones to the world's fastest supercomputer. [Fugaku is] challenging the status quo and showing the world what is possible in Arm-based high-performance computing."

Satoshi Matsuoka, head at RIKEN, describes Fugaku’s victory as world’s fastest supercomputer to be rather unintentional describing that developers at RIKEN were looking forward to making user friendly supercomputer for research purposes.

//Fugaku is named after Mount Fuji of Japan which symbolizes its top performance and wide range of its user.

Fugaku is currently being used for COVID 19 research and droplet simulations. It is also being used for drugs research combining through 1,000 of database to find out suitable drugs to mitigate symptoms of coronavirus. Fugaku is going to be used to help scientists and researchers on weather and climate forecasting, especially disaster warnings. "Sudden torrential rainfalls are becoming more common in Japan and the southern U.S. because of global warming" Matsuoka said. For Japan, one of the world's most vulnerable countries to earthquakes, tsunamis and flooding it will provide scientists aid in compiling through large scale models to study problems and solution also ways to mitigate for this phenomenon’s.

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Frontier or OLCF-5 is an exascale supercomputer being planned for delivery in 2021 at the Oak Ridge Leadership Computing Facility. The target computation performance is ~1.5 exaFLOPS. It is being built at a cost of US$600 million.

Rank Country Number of Supercomputer in Top500

1 China 226

2 US 114

3 Japan 30

4 France 18

5 Germany 16

//Despite coming second on count US leads the performance spot with 644 petaflops in aggregate to that of 565 petaflops of China.

Links:

Linpack Benchmark: <https://en.wikipedia.org/wiki/LINPACK_benchmarks#HPL>

CDC 6600: <https://en.wikipedia.org/wiki/CDC_6600#Description>

Fugaku Photos: <https://twitter.com/Fujitsu_Global/status/1275104108068909056> shared by Fujitsu on twitter

Arm video on twitter: <https://twitter.com/Arm/status/1276179952073945095> and <https://twitter.com/Arm/status/1275528877419515905>

Photos:

