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CHINESE SUPER COMPUTERS AND RADARS

Fastest Supercomputer. Although the US has dominated supercomputing for many years, China has been No 1 on the global Top500 list since 2013, with the launch of Tianhe-2, which was built by China's National University of Defence Technology. In 2015, US President Barack Obama signed an executive order to authorise the creation of the National Strategic Computing Initiative (NSCI) to accelerate the development of technologies for Exascale supercomputers and to fund research into post-semiconductor-based computing. Three years later in 2018, the Summit and Sierra US supercomputers took top spots, while China's Sunway Taihu Light and Tianhe-2 were in third and fourth positions, ending China's five-year dominance.

China is planning a multibillion-dollar investment to upgrade its supercomputer infrastructure to regain the top spot and build the fastest supercomputer. Presently China and the US own 45.4 per cent and 21.8 per cent of the world's fastest supercomputers globally respectively, followed by 6.2 per cent for Japan and 4 per cent in the United Kingdom. Multibillion-dollar investment is aimed at upgrading three existing supercomputer labs in China to the latest Exascale computing technology over a three-year period. Exascale computing refers to machines capable of at least a quintillion (or a billion billion) calculations per second. Chinese National Super computer Centre is in Jinan, Shandong province. China is aiming for its newest Shuguang supercomputers to operate at about 50 per cent faster than the current best US machines. These next-generation Chinese supercomputers will be delivered to the computer network information Centre of the Chinese Academy of Sciences (CAS) in Beijing for the global Top 500 rankings of the world's fastest computers.

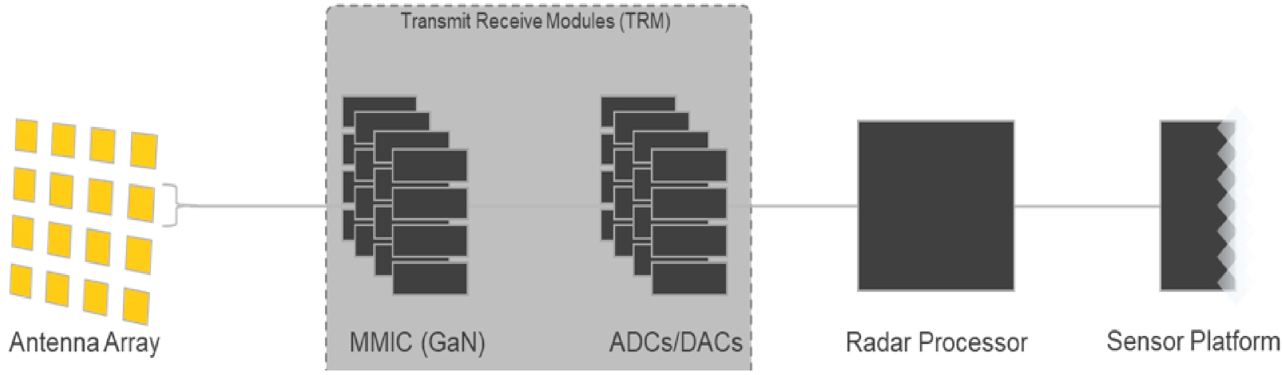
Comments. Huge information processing capability is the foundation of artificial intelligence, the industrial internet, 5G and other future industries. Supercomputers are widely deployed for tasks ranging from weather predictions and modelling ocean currents to energy technology, simulating nuclear explosions and also in commercial applications (driven by developments in artificial intelligence). Thus the ability to produce state-of-the-art supercomputers is an important metric of any nation's technical prowess.

Supercomputer rivalry between the US and China has also been reflected in trade friction between the two countries, especially since China's rapid rise in the field. China began to build supercomputers without US semiconductors after the Obama administration banned the sale of high-end Intel, Nvidia and AMD chips for Chinese supercomputers in 2015. The following year, China launched its Sunway Taihu Light supercomputer, powered by a Linux-based Chinese operating system and incorporating a locally developed chip called Matrix-2000. This machine became the fastest supercomputer on the Top500 list in June 2016.

The Qingdao National Laboratory for Marine Science and Technology, the National Supercomputing Centre of Tianjin and National Supercomputing Centre in Shenzhen are expected to specifically receive the funding to complete their upgrade to Exascale computing machines in 2020, 2021 and 2022, respectively. Reportedly the Exascale computers in these centres should be able to perform calculations several times faster than Summit, the top US machine. The four other national supercomputer centres in China are located in Wuxi, Jiangsu province, Ji'nan, Shandong province, Changsha, Hunan province, and Guangzhou, Guangdong province. Leading supercomputer manufacturers in China include the National Research Centre of Parallel Computer Engineering and Technology, Dawning Information Industry, and the National University of Defence Technology. The US has its Exascale Computing Project with the goal of launching an Exascale computing ecosystem by 2021.

(Source: https://www.scmp.com/tech/policy/article/3002117/china-plans-multibillion-dollar-investment-knock-us-top-spot-fastest; South China Morning Post print edition as: China has scheme to regain crown in supercomputing)

Gallium Nitride (GaN) Front-End Components for Advanced Radar. An innovation having huge enabling impact on radar technology over the next several years is Gallium Nitride (**GaN**) for Front-End Components. Gallium nitride (GaN) is a material that can be used in the production of semiconductor power devices as well as RF components and light emitting diodes (LEDs). GaN has demonstrated the capability to be the displacement technology for silicon semiconductors in power conversion, RF, and analog applications. It can operate at much higher voltages than conventional semiconductor material—and higher voltage means better efficiency. RF power amplifiers and attenuators that use GaN use less power and produce less heat, so there is a huge demand for component suppliers with GaN chips.



Comments. In aerospace and defense, some of the biggest areas of innovation and investment aren't on the battlefield but in the electromagnetic spectrum. GaN components are particularly in demand for the Active Electronically Scanned Array (**AESA**) radars. These radars consist of hundreds or even thousands of antennas, and steer beams electronically without physically moving the antenna. Because there are so many antenna elements, GaN components will be important for this technology. They enable AESA radars to achieve the same output power more efficiently in a smaller form factor.

Gallium Nitride (GaN) is a material that can be used in the production of semiconductor power devices as well as RF components and light emitting diodes (LEDs). GaN is considered the biggest semiconductor innovation since silicon. Without gallium, the semiconductors that power smart phones and data-centric networks would not be possible. Unlike Rare Earth Elements (REE's), gallium is not a common metal in the Earth's crust, but it does occur regularly alongside Aluminum in a mineral known as bauxite. Nations aspiring for super power status need to on the lookout for gaining control over sources of Rare Earth Elements (REE)/ minerals/ material compounds, which would be of use in the manufacture of semiconductor devices and ensure the uninterrupted availability of these types of critical materials. The next generation warfare is likely to be defined by technological superiority and thus GaN assumes significance, especially in light of it's relevance in AESA radars. It's criticality may be treated akin to that of REE, which are discussed below.

REEs are used in everything from cell phones to electric vehicles to smart bombs. It is estimated that the world has 99 million tones of rare earth reserve deposits. Major reserves exist in China, California, India, Brazil, Australia, South Africa, and Malaysia. China's reserves are estimated to be 36 million tones or roughly 30 % of the world's total reserves. China typically supplies about 80% of the global rare earths market, or 156,000 tones. The only supplier outside China right now is Lynas Corp, which mines REEs from its Mount Weld Mine in Western Australia and processes them in Malaysia. The operating license of this plant is however up for renewal in September and it would be assessed by Malaysian authorities. For the second half of 2018, China's quota for rare earths separation and smelting had been cut by 36%, quoting research firm Adamas Intelligence. That means 45,000 tons produced would be only providing enough material for domestic manufacturers. Earlier in 2009 China had suddenly reduced its exports of REEs by 40%.

(Source: https://forums.ni.com/t5/NI-Blog/4-Underlying-Technologies-That-Are-Changing-the-Game-for/ba-p/3838006?cid=Twitter-127904-Global-Paid_Broadbasedand http://www.mining.com/web/rare-earths-cross-hairs-new-high-tech-arms-race/)