

# Fujitsu Digital Annealer

## The world's first quantum-inspired technology, delivering unprecedented problem-solving capability

Innovating business processes and operations through the use of Artificial Intelligence and other advanced technologies is becoming a top priority for organisations striving for a competitive edge. But solving the most complex optimisation problems quickly with existing classical computers is currently unattainable today. As a result, organisations need to leverage advanced technologies and harness additional computing power to solve these highly complex combinatorial problems.



### Introducing Fujitsu Digital Annealer

Fujitsu is leading the way in quantum-inspired computing. It has developed a revolutionary technology that can solve real world combinatorial optimisation problems today; problems which are otherwise unsolvable with existing computing methods.

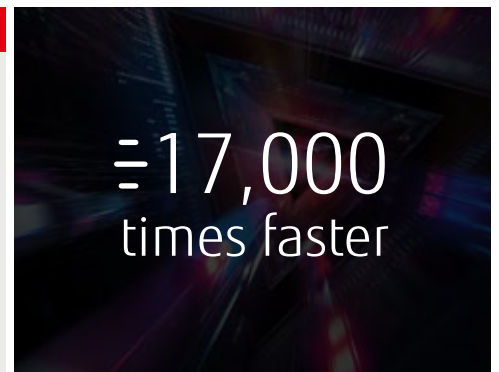
Powered by pioneering quantum-inspired technology, simultaneous data processing capabilities allow the Fujitsu Digital Annealer to almost instantly find the optimal combination of massively complex, previously unmanageable data variables. This unique approach compares thousands of possible answers at the same time, rather than in sequence, as processed by traditional computing. The result is unprecedented problem-solving capability.

The Digital Annealer can be deployed as a cloud-hosted or on-premise service, dependent upon the customer's requirements. It also integrates seamlessly into standard data centre operating environments, without the need for the complex infrastructure required by quantum computers, which are energy-intensive and require cooling systems running at near absolute-zero temperatures.

### Combinatorial optimisation explained

Combinatorial optimisation refers to finding the optimal solution from a finite set of options. As the finite set of options increases, the computational power and the time needed to find the solution increases exponentially. Proven to be 17,000 times faster than industry standard compute<sup>1</sup>, Fujitsu's Digital Annealer is a revolutionising technology that can help solve real world combinatorial optimisation problems today, overcoming the challenges of traditional quantum computing.

<sup>1</sup> Based on solving a typical combinatory optimisation problem in software using the algorithm implemented in the hardware running on a Zeon family processor.



### Unprecedented problem-solving capability

With the ability to find near-instant answers to problems that were previously too complex, even for supercomputers to solve in real time, the second-generation Fujitsu Digital Annealer is enabling organisations to make a rapid and affordable leap to solve such complex combinatorial optimisation problems. This quantum-inspired technology is enabling dramatic breakthroughs in business process innovation. It's already delivering unprecedented problem-solving capability with applications across many industries, with the potential for each of these applications to be adapted for military use:



#### **Automotive: *Factory optimisation***

Car manufacturers are continually seeking to improve production efficiencies in order to accelerate the deployment of new vehicles. Tasks include logistics improvements, vehicle design and robotics optimisation. Once any errors and flaws such as corrosion, defects and quality issues have been identified, Digital Annealer-powered production can immediately improve the overall production planning which will ultimately improve vehicle delivery times.



#### **Financial Services: *Low-risk portfolio optimisation***

A Digital Annealer-powered portfolio solution finds the ideal investment allocation that perfectly balances risk and reward by grouping stocks that correlate with price variations, enabling portfolios to be managed with accuracy and reduced risk. The Digital Annealer solution can instantly find the best permutation from among 20 or more stocks, equivalent to more than one quintillion permutations.



#### **Distribution: *Warehouse inventory management***

In factories and distribution warehouses, the time it takes workers to walk around picking parts manually can be lengthy. Using Digital Annealer in a factory environment, the Fujitsu IT Services team was able to optimise routes and in-stock part placement so workers can successfully reduce their distance travelled by up to 45%, significantly increasing productivity.

### Delivering information advantage in Defence & National Security

The potential applications of the Fujitsu Digital Annealer to solve hugely complex combinatorial problems are vast. While we have just shown three possible real-life applications here, each has the potential to be adapted for military use in supply chain or logistics functions, for instance. Military organisations and intelligence functions who have a need for detailed situational assessment and awareness of an ongoing operation could also benefit from this technological advancement.

Any problem needs to be translated into the DA-specific format to then identify the optimum combination to a particular solution. Whether there are little or vast amounts of data available, this can then inform critical decision-making processes. The time it takes to make such decisions whilst operating in often challenging environments, potentially in the battlespace, can be the difference between the success and failure of a mission, putting people's lives at risk.

Fujitsu's Digital Annealer has the potential to deliver a huge information advantage in many military applications:

- Allocation of personnel can be optimised, taking in to consideration availability, skill set and location to ensure the right personnel are allocated to the right task or operation in the fastest, most efficient way possible.
- Common intelligence functions can be dramatically augmented, with tasks like graph similarity and data point clustering being performed much faster to find the optimum solution and inform faster, more reliable decision-making.
- Supply chain and logistics operations can be optimised ensuring all available resources are deployed as quickly and efficiently as possible to achieve a mission's objectives.

### Collaboration with top-tier global partners

Fujitsu remains totally committed to developing leading technology to serve our global customers. Close collaboration with industry-leading partners is essential to support this commitment. Fujitsu has established a strategic partnership agreement with 1Qbit (a Canadian company), the only vendor of commercial quantum computer software, along with an innovation hub with the internationally renowned University of Toronto, to advance our quantum-inspired technology and to continue to drive innovation in this exciting space.

### Fujitsu Digital Annealer Benefits at-a-glance

- The Digital Annealer solution can be miniaturised into a conventional data centre environment, delivering much improved energy efficiency and much lower energy costs than true quantum computers.
- Unlike other quantum computers, Digital Annealer is able to operate at normal room temperatures and doesn't need advanced cooling solutions.
- Digital Annealer provides 8,192-bit full connectivity, allowing all bits to freely exchange signals, enabling the platform to deal with real-world, large-scale problems.
- Digital Annealer is 17,000 times faster than industry standard compute<sup>2</sup>.
- The Digital Annealer solution supports a common tooling platform to that of quantum-annealing systems, making it easy for existing customers to qualify for quantum computing when this technology matures.

<sup>2</sup> Based on solving a typical combinatorial optimisation problem in software using the algorithm implemented in the hardware running on a Zeon family processor.

## Why Fujitsu?

For over 50 years we have innovated with the MOD, Government Departments and intelligence communities, co-creating new technologies and capabilities. As a result, Fujitsu has around 4,000 security cleared staff and the experience to deliver and manage both generic industry offerings and those tailored to specialist needs at OFFICIAL, SECRET and ABOVE SECRET classifications.

### Enabling Your Information Advantage

In today's complex, digital operational environment, never before has information been such a key asset in securing operational advantage. Fujitsu's vision is to provide customers with the means to translate complex data into useful information upon

which to base critical decisions and actions. Transforming this ever-increasing pool of data into meaningful, useful information through analytics, automation and genuine Artificial Intelligence is critical to achieving this goal.

Fujitsu is fully committed to working closely with our customers, and through the use of co-creation will seek to enhance capability both through the acceleration of existing processes, and also through the delivery of truly new capabilities and ways of working. Our approach is based upon maximising both existing investment and best-in-class innovation, delivering the full spectrum of capabilities needed to enable your information advantage.



### Contact

Telephone: +44 (0)870 242 7998  
Email: askfujitsu@uk.fujitsu.com  
Ref: 3895  
uk.fujitsu.com

Unclassified. © 2019 FUJITSU. Fujitsu, the Fujitsu logo, are trademarks or registered trademarks of Fujitsu Limited in Japan and other countries. Other company, product and service names may be trademarks or registered trademarks of their respective owners. Technical data subject to modification and delivery subject to availability. Any liability that the data and illustrations are complete, actual or correct is excluded. Designations may be trademarks and/or copyrights of the respective manufacturer, the use of which by third parties for their own purposes may infringe the rights of such owner. ID: 6014-005-07/2019.