

## MEDIA FACTSHEET

25 NOVEMBER 2021

### **A\*STAR AND LOCAL SME DEVELOP ENERGY-EFFICIENT COOLING SYSTEM FOR DATA CENTRES THAT REDUCES ENERGY CONSUMPTION BY UP TO 50 PER CENT**

*Developed in collaboration with ERS Industries, the KoolLogix cooling system for data centres uses passive heat extraction and removal for improved energy efficiency and thermal management, and lower carbon emissions*

**SINGAPORE** – A\*STAR’s Institute of High Performance Computing (IHPC) and ERS Industries Pte Ltd, a Singapore-based data centre solutions company, have developed an energy-efficient cooling system, KoolLogix, which uses an innovative heat exchange and phase change approach that can reduce energy consumption at data centres by up to 50 per cent. Using Computational Fluid Dynamics, IHPC accelerated and optimised KoolLogix cooling system’s product design and validated its performance.

A growing digital economy means the demand for data centres will increase, supported by emerging technologies in 5G, artificial intelligence (AI) and the Internet of Things (IoT). In Singapore, there are about 60 data centres accounting for about 7 per cent of the country’s total electricity consumption in 2020.<sup>1</sup> South-east Asia will also continue to see significant investment into digital infrastructure and data centre development, with the region becoming one of the fastest-growing data centre hubs globally.

However, data centres are intensive users of water and electricity, and their cooling systems typically use an estimated 35 to 40 per cent of the total power required to run a data centre, according to a study by Digital Realty and Eco-Business.<sup>2</sup> In 2019, the

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<sup>1</sup> CNA: Singapore puts ‘temporary pause’ on new data centres: Why and what it means for the industry, <https://www.channelnewsasia.com/business/new-data-centres-singapore-temporary-pause-climate-change-1355246> (10 May 2021)

<sup>2</sup> Eco-Business: Sustainable growth a top priority for Southeast Asia as region set to deliver fastest data centre growth, <<https://www.eco-business.com/press-releases/sustainable-growth-a-top-priority-for-southeast-asia-as-region-set-to-deliver-fastest-data-center-growth-digital-realty-eco-business-study/>>( 28 Oct 2020)

Singapore government informed the industry of a temporary pause on the development of new data centres<sup>3</sup> to ensure their growth in a sustainable manner and with reduced carbon footprint.

### ***Features of the innovative cooling system***

Recognising these opportunities and the need for more effective cooling solutions, IHPC and ERS co-developed KoolLogix cooling system, a novel cooling solution using phase change physics that transforms the way to cool data centres.

Compared to conventional computer room air conditioning (CRAC) cooling systems, the KoolLogix cooling system provides targeted cooling to remove heat from servers directly. The system also recycles and redeploys the waste heat discharged by servers for refrigerant phase change cycle. Such novel designs create substantial energy savings and thus lower carbon emission.

The cooling system is also modular and scalable to address cooling requirements. This eliminates typical high overhead costs that come with CRAC systems such as raised flooring, row cooling equipment, booster fans, refrigerant pumps or compressors, and use of aisle containment systems.

### ***Partnerships with public agencies and companies in the innovation ecosystem***

As part of A\*STAR's talent secondment scheme for local enterprises called T-Up<sup>4</sup>, Dr Li Hongying from IHPC was seconded to ERS Industries in 2019 where she developed an advanced computational fluid dynamics model for the KoolLogix cooling system. Dr Li was awarded the T-Up Emerging Talent Award<sup>5</sup> at the SME Day 2020@SWITCH and is a winner of the Underwriters Laboratories ASEAN-US Science Prize for Women 2021.

Since 2014, ERS Industries has been participating in A\*STAR's Operation and Technology Road mapping (OTR) initiative to plan strategically for future business growth, from which the company developed a 20kW cooling system and commercialised it by 2019.

As part of its business expansion strategies for KoolLogix cooling system, ERS Industries spun off a new company called KoolLogix Pte Ltd. The cooling system has been implemented in data centres locally such as CDC, a facility operated out of a factory space leased from JTC. The CDC data centre is owned and operated by Media Access International, a tenant of JTC since 2009. The Power Usage Effectiveness (PUE), a ratio that describes how efficiently a computer data centre uses energy, is 1.29. Prior to the

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<sup>3</sup> MTI: Written reply to PQ on new data centres, <<https://www.mti.gov.sg/Newsroom/Parliamentary-Replies/2021/01/Written-reply-to-PQ-on-new-data-centres>> (1 February 2021)

<sup>4</sup>The Technology for Enterprise Capability Upgrading (T-Up) initiative aims to second A\*STAR Research Scientists & Engineers (RSEs) to local enterprises to build/ upgrade their in-house R&D capabilities.

<sup>5</sup> A\*STAR News: A\*STAR T-Up Emerging Talent Award, <<https://www.a-star.edu.sg/ihpc/news/news/publicity-highlights/a-star-t-up-emerging-talent-award>> (9 December 2020)

KoolLogix installation, the PUE has been more than 3.0. These promising results support JTC's sustainability drive and commitment in leveraging green practices in optimising energy and water usage and cutting down carbon emission.

KoolLogix Pte Ltd is now expanding into the ASEAN region as part of its future growth strategy to tap into the fast-growing data centre development in Asia.

### **Quotes:**

- Dr Lim Keng Hui, Executive Director of A\*STAR's Institute of High Performance Computing (IHPC), said: "Data centres are in great demand as data form the backbone of the digital economy. However, they also contribute significantly to carbon footprint. IHPC is pleased to work with ERS Industries to help data centres operate more sustainably using such novel cooling solutions, leveraging our capabilities in computational fluid dynamics and high performance computing. This public-private partnership is testament to A\*STAR's efforts to encourage businesses to adopt innovative technologies to become more competitive, and pivot into new markets and new products."
- Mr CK Cheong, Chief Executive Officer (CEO) of ERS Industries and its spin-off KoolLogix Pte Ltd, said "We are pleased to partner with A\*STAR's IHPC in the development of KoolLogix cooling system, an innovative energy saving thermal management solution with distinctive features that help data centre customers solve complex space and thermal management problems. The Computational Fluid Dynamics modelling and simulation support from IHPC greatly helps with our product development process and accelerate time to market for KoolLogix. Our transformation journey from a rack solution to an eco-friendly thermal solution company for Data Center was enthusiastically supported by OTR programme. It helps us sharpened our strategic planning and development roadmap. We are excited to have KoolLogix solutions validated at CDC customised R&D site supported by JTC as part of their green initiative. The testing and evaluation results from the demanding environment demonstrated that KoolLogix has raised to the challenge and has helped CDC to attain a PUE of 1.29, as compared to Asia Pacific average metric of 1.69<sup>6</sup>. With this success, we are happy to be invited by MAI-CDC to participate in their next home base project to achieve PUE < 1.2 by Q2, 2022 before their roll out to the region."
- Ms Sophia Ng, Director of JTC InfoComm Media & Start-Up Cluster, said "JTC supports the transition towards a low-carbon economy and our estates serve as living testbeds for game-changing innovations and sustainability technology adoption. Such testbeds bring us a step closer to our goal for a more sustainable Singapore."

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<sup>6</sup> Uptime Institute: Which regions have the most energy efficient data centres?

<<https://journal.uptimeinstitute.com/datacenter-energy-efficiency-by-region/>> (24 August 2020)

- Mr Ng Hoo Seng, Chief Executive Officer (CEO) of Media Access International, said “We are delighted to complete the implementation of this MAI-CDC project using a non-purpose build facility from inception to a fully loaded operational data centre in less than three months. This feat was accomplished with the deployment of CDC-KoolLogix cooling solution and the PUE achievement of 1.29 is really impressive. This elevates CDC to the forefront of becoming one of the most energy efficient data centre in the region. It gives us confident to mass deploy this innovative cooling solution across our data centre footprint in Singapore, Indonesia and other regional market. As a growing regional data centre operator with roots in Singapore, it is very encouraging to see local developed solutions performing at this level. Our next milestone is to be the first Singapore data centre operator to achieve a PUE of lower than 1.2 in partnership with KoolLogix in a scale-up project to position CDC as the most efficient data centre operator in the region by Q3, 2022. In land scarce Singapore, the ability to achieve such low PUE without need for customised data centre facilities, coupled with our inhouse AI powered DCIM system (monitoring, controlling and leveraging the energy efficiency flow and usage within green environmental requirements) and low carbon footprint solution will go a long way in supporting the digitalisation of the economy.”

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**Enclosed:**

**ANNEX A – Images of test-lab and computer simulation**

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## **About the Institute of High Performance Computing (IHPC)**

A\*STAR's Institute of High Performance Computing (IHPC) was established in August 1998 to provide leadership in computational modelling, simulation and AI to solve major scientific, industrial and societal challenges. It seeks to promote and spearhead scientific advances and technological innovations through multidisciplinary R&D, and to develop impactful applications to further economic growth and improve lives.

Our research focuses are in computing science and AI; large scale complex systems modelling; social and cognitive computing; computational engineering mechanics, fluidic dynamics, electronics and photonics, materials science and chemistry. These core capabilities enable IHPC to tackle real-world challenges in physical and human systems, such as in manufacturing, energy, transportation and urban systems, environmental sustainability and healthcare. For more information on IHPC, visit [www.a-star.edu.sg/ihpc](http://www.a-star.edu.sg/ihpc).

## **About the Agency for Science, Technology and Research (A\*STAR)**

The Agency for Science, Technology and Research (A\*STAR) is Singapore's lead public sector R&D agency. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit the economy and society. As a Science and Technology Organisation, A\*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by improving societal outcomes in healthcare, urban living, and sustainability. A\*STAR plays a key role in nurturing scientific talent and leaders for the wider research community and industry. A\*STAR's R&D activities span biomedical sciences to physical sciences and engineering, with research entities primarily located in Biopolis and Fusionopolis. For ongoing news, visit [www.a-star.edu.sg](http://www.a-star.edu.sg).

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## **About ERS Industries Pte Ltd**

Since 1995, ERS industries, a Singapore home-based SME, has been providing mechanical enclosures for various engineering use. Its innovation drive in 2014 led to its award-winning E@Rack IT Server Cabinet to help data center clients improve on thermal management. Since then, ERS has also developed other products focusing on the same theme. In 2018, ERS spun-off KoolLogix Pte Ltd, for its namesake product the KoolLogix System, an innovative way of improving data centre rack cooling, by use of a passive heat removal approach, which leads to lower energy consumption and improved carbon emission management.

ERS is currently serving as member on IMDA's Tropical Data Centre Committee, and Ex-Co on SGTech's Data Centre Subcommittee.

For more information on ERS, visit [www.ers.com.sg](http://www.ers.com.sg).

For more information on KoolLogix, visit [www.koolLogix.com](http://www.koolLogix.com)

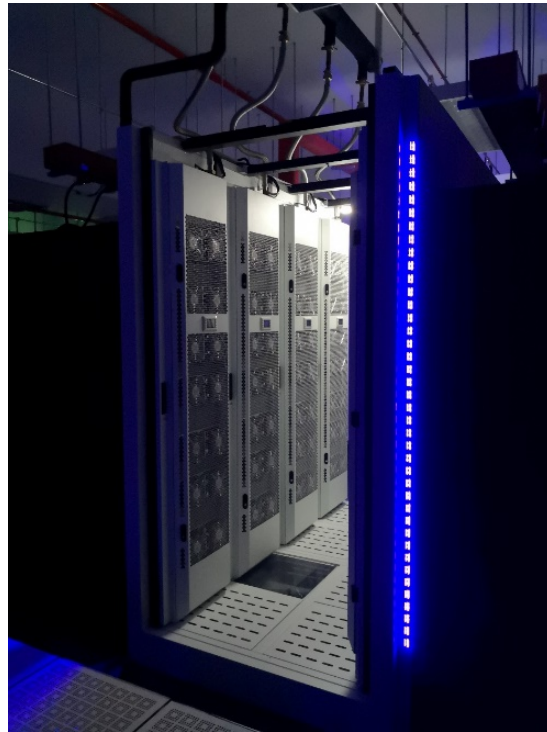


Image 1: A test lab set-up to innovate, develop and assess the performance of KoolLogix's cooling system.

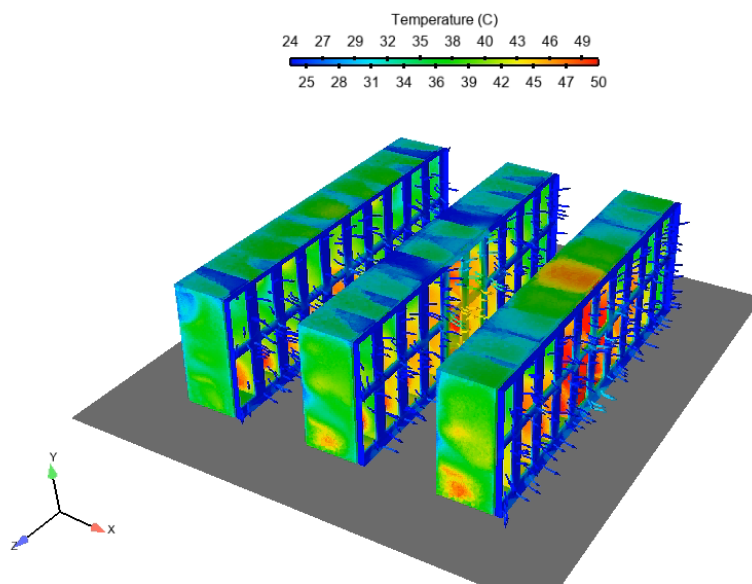


Image 2: A computer simulation by IHPC to provide detailed physics insights to speed up the design process