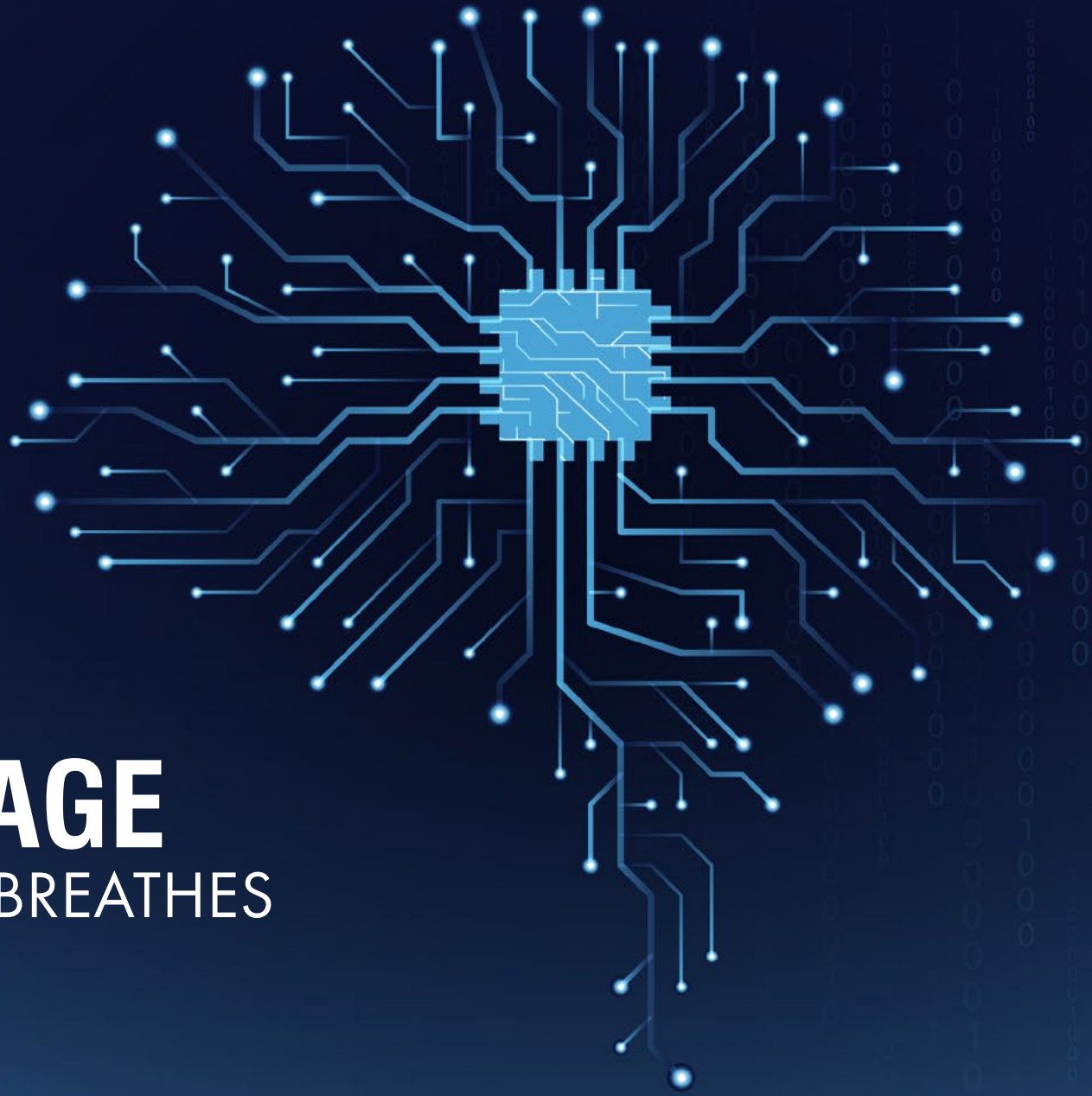
4DS Memory



MEMORY FOR THE AI AGE

THE MEMORY THAT BREATHES

APRIL 2024

Disclaimer

This release contains certain forward-looking statements that are based on the Company's management's beliefs, assumption, and expectations and on information currently available to management. Such forward looking statements involve known and unknown risks, uncertainties, and other factors which may cause the actual results or performance of 4DS to be materially different from the results or performance expressed or implied by such forward looking statements. Such forward looking statements are based on numerous assumptions regarding the Company's present and future business strategies and the political and economic environment in which 4DS will operate in the future, which are subject to change without notice. Past performance is not necessarily a guide to future performance and no representation or warranty is made as to the likelihood of achievement or reasonableness of any forward-looking statements or other forecast. To the full extent permitted by law, 4DS and its directors, officers, employees, advisers, agents and intermediaries disclaim any obligation or undertaking to release any updates or revisions to information to reflect any change in any of the information contained in this release (including, but not limited to, any assumptions or expectations set out in the release).

You should not place undue reliance on these forward- looking statements. Except as required by law or regulation (including the ASX Listing Rules) we undertake no obligation to update these forward- looking statements.

4DS Memory

Agenda

The AI Age: Meaning, Impact and Trends

The Challenges for the IC Industry

4DS Memory: Interface Switching ReRAM
– how it works, why it's different, where it excels

The importance of Speed and Power

The importance of Scalability and Programmability

4DS: the Right Memory for the Right Market at the Right Time

4DS Corporate Summary

Q&A

4DS Memory

Artificial Intelligence

Nvidia Co-founder and CEO Jensen Huang described the emergence of artificial intelligence (AI) as the beginning of a new industrial revolution, emphasising that there's an ongoing global 'awakening' concerning AI technology.[1]

He also believes that, over the next four to five years, a trillion dollars' worth of data center infrastructure and hardware will be built across the world.[2]

TSMC founder Morris Chang recently revealed that customers have approached the company to build up to ten new fabs for AI processors, indicating a significant increase in demand for processors used in AI applications.[3]

Apple CEO Tim Cook, at the 2024 annual shareholder meeting, said his company is "investing significantly" in artificial intelligence.[4]

Sources

1. *https://www.businesstoday.in/technology/top-story/story/beginning-of-new-industrial-revolution-nvidias-jensen-huang-says-theres-an-ai-awakening-in-every-country-417256-2024-02-13*
2. *https://www.datacenterdynamics.com/en/news/nvidia-ceo-jensen-huang-predicts-data-center-spend-will-double-to-2-trillion/#:~:text=Nvidia%20CEO%20Jensen%20Huang%20believes,be%20built%20across%20the%20world*
3. *https://abachy.com/news/tsmc-founder-reveals-unprecedented-demand-10-new-fabs-produce-ai-chips*
4. *https://www.cnbc.com/2024/02/28/apple-annual-shareholder-meeting-2024-ai-investments.html*

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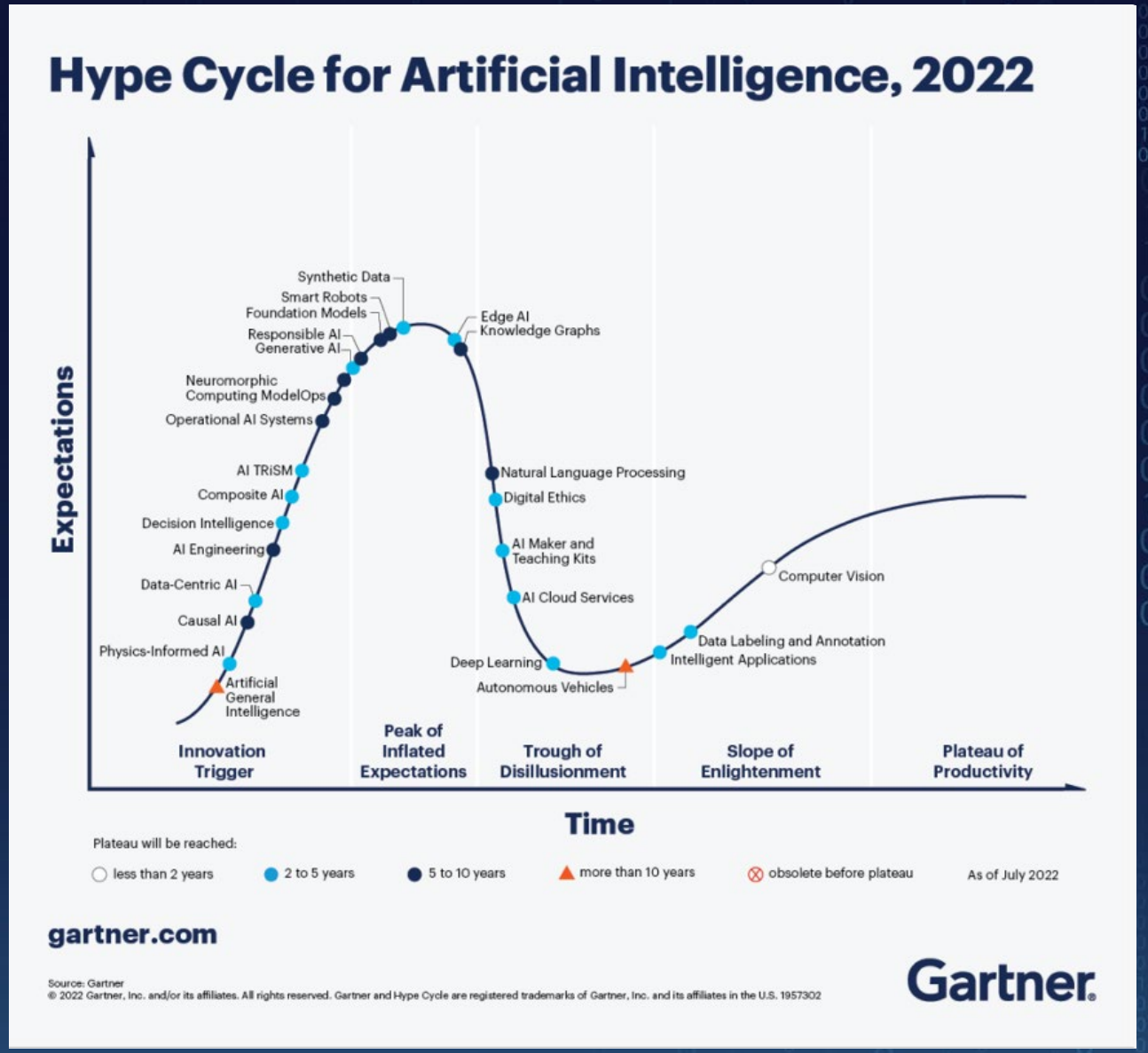
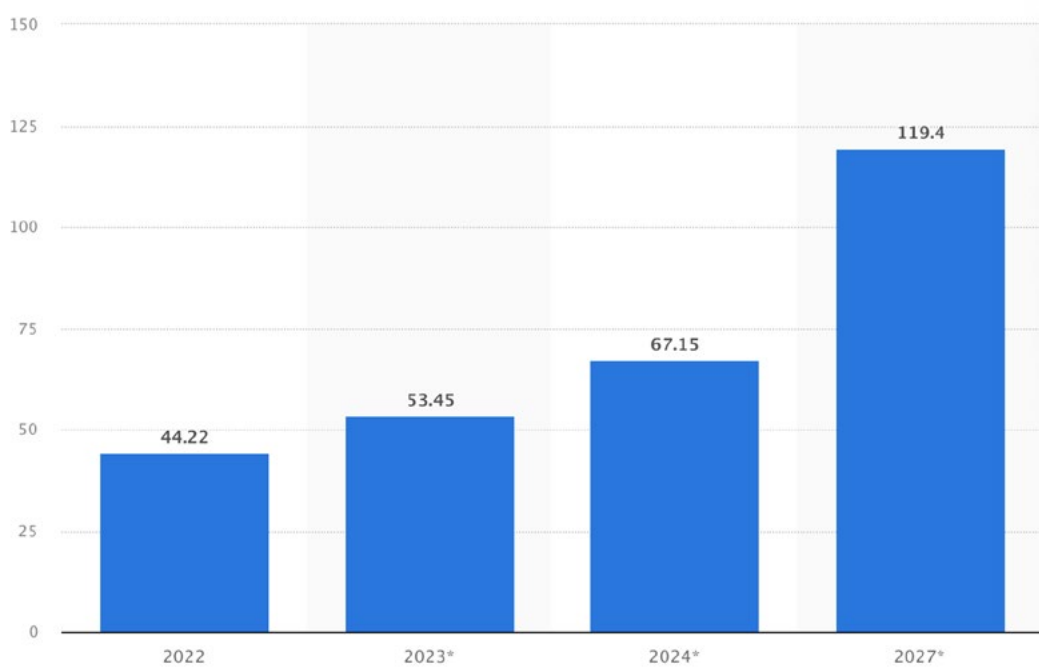
AI means many different things to the market



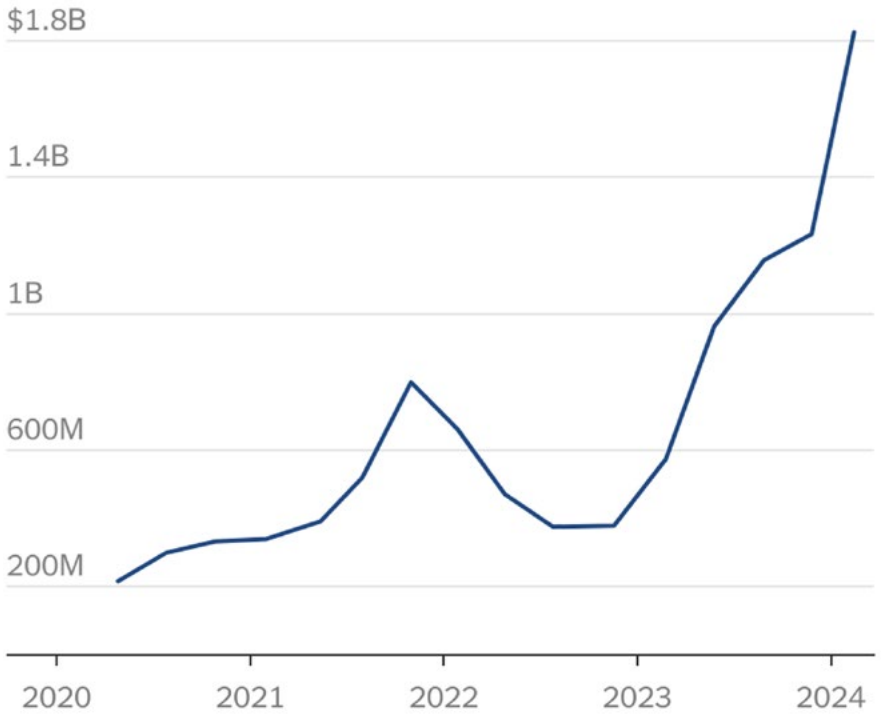
Which is driving a golden age of emerging processor architectures and IC growth continued

Artificial intelligence (AI) chip market revenue from 2022 to 2027



Source: © Statistica, 2024

Nvidia market capitalisation



Source: S&P Capital IQ. *By The New York Times*

Generative AI
Transforming the Compute Industry

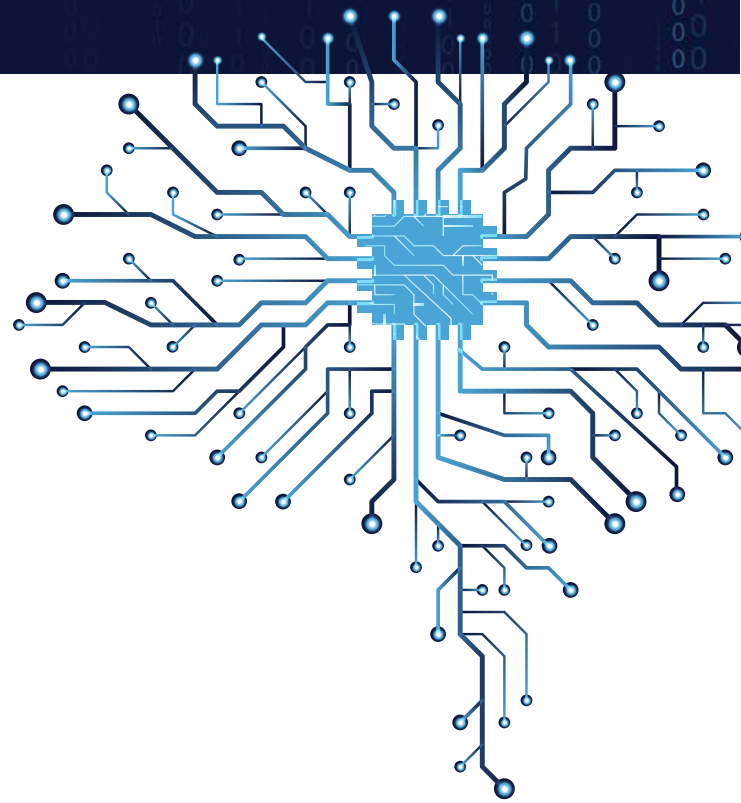
AI refers to a long history of machine learning development that has evolved over the past 40 years in the industry

Machine learning is in everything from your home thermostat to your car's antilock braking to your Alexa connected device

Generative AI refers to the subset of artificial intelligence techniques that enable machines to generate new content, imitate human creativity, and produce realistic outputs

AI models are built on different types of neural nets which use very large sets of data to create predictive models for different tasks (text generation, image recognition or generation, code writing)

4DS: The Right Memory for the Right Market at the Right Time



The New Age of AI Processing is built on decades of research into neuromorphic processing and Neural Net modeling

These models require huge amounts of data and are the result of billions of weighted matrix calculations

There is an explosion of new processor architectures in development to overcome the speed, energy and memory bottleneck challenges

The introduction of a new non-volatile memory with high speed and high density 'would initiate a revolution in computer architecture'*

4DS is that memory, at the right time, for the most important market in the world

*__Source:__ *Institute of Electrical and Electronics Engineers.*

4DS Memory

An Overview of Memory Terminology

SRAM

Volatile, provides the fastest read time, used for immediate access by CPU. But also large in size and power (6 transistors needed per cell)

DRAM

Volatile, provides large data storage capabilities with fast read and write times. Architected for large data transfer at high speeds. Needs constant refresh to retain data

4DS ReRAM

Persistent, provides hours of retention with very fast write time. Operates at the same speeds as DRAM

NAND

Non-volatile, provides lowest cost per byte of storage. Architected for very large data transfer and storage. Slow write compared to DRAM

MRAM, PCRAM, Filamentary ReRAM

Non-volatile, provides high density alternatives to Flash for advanced node processes. Speed and energy vary but generally slower than DRAM

Warm vs Hot Data

Different classes of data needed on demand by the CPU or GPU

CXL or Compute Express Link

De facto communications protocol to manage Storage Class Memory

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ReRAM: Two Different Technologies, Two Different Memory Solutions

4DS PCMO

Area based, lower current density programming, high endurance

Up to 10^9 Endurance

Analog characteristics

Persistent – tunable retention from seconds to days

Long retention and short retention can be integrated on same chip

Extremely fast EPIR one-shot response to programming signal – 4.7ns write, well within DRAM window

Ideal for in-memory compute or Warm Data storage

OTHERS – Filamentary

Filament based, high current density, low endurance for reliable cell

Endurance can be as low as 10^4

Primarily designed for digital use

Non-Volatile – but requires strong error correction or high energy to create multiple filaments

Iterative programming needed for reliable cell

Used as embedded NOR replacement or CXL-based storage memory

The 4DS Advantages

Persistent Memory at DRAM Speeds

4.7ns write for 1 hour read – no refresh needed

Single Shot programming

Tunable Retention from Seconds to Days

Highest energy optimization for warm data applications

Can trade off long retention for reduced endurance

Low Energy per Bit

For Warm Data and Persistent Memory Applications

Scalable to Any Process Node

Simple fab processing, compatible with standard tools

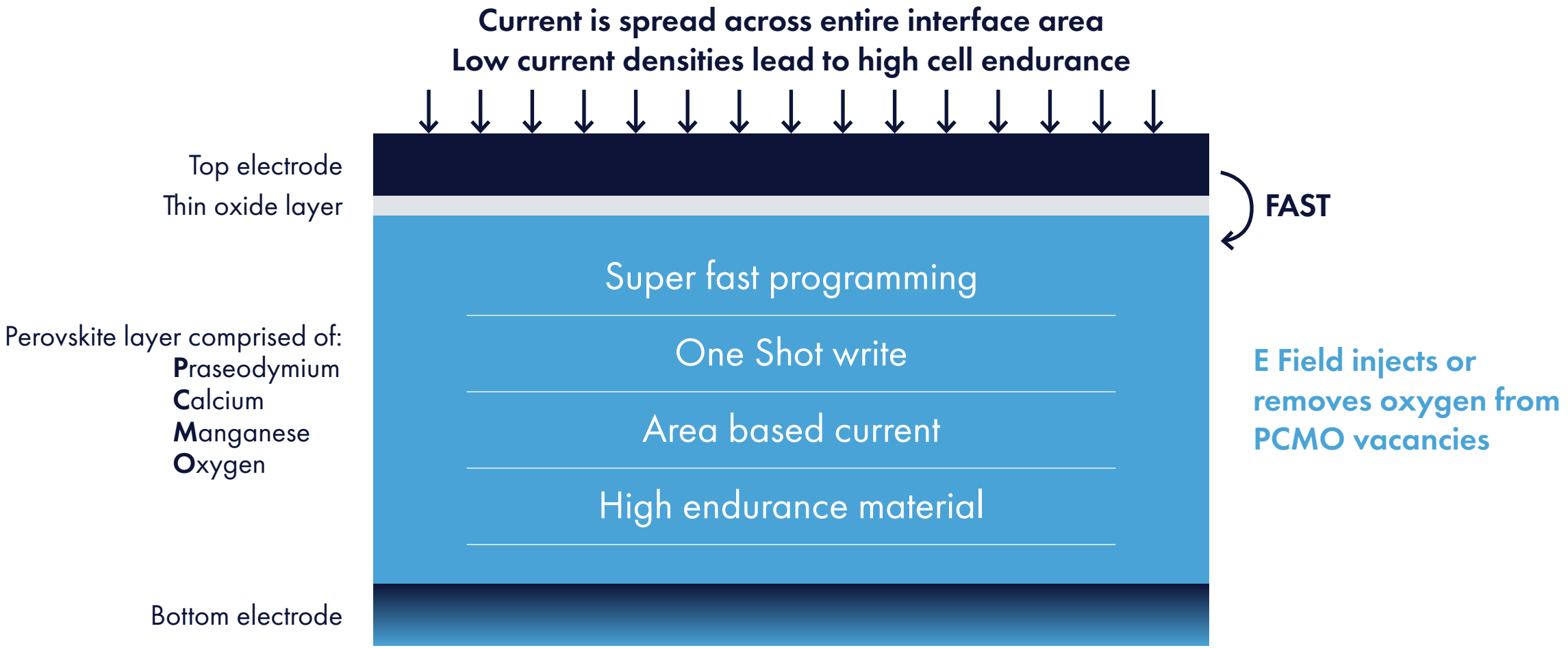
Low-cost BEOL Integration, compatible to any advanced CMOS logic process

Analog Programmability

By time or voltage modulation

4DS Memory

What is PCMO and why is it unique?



What is PCMO and why is it unique? continued

High O^- affinity by top electrode creates an oxygen depletion layer at the surface junction (oxygen vacancies in the PCMO lattice)

Pulse of electric field pushes oxygen back into PCMO, filling vacancies (very fast response: EPIR)

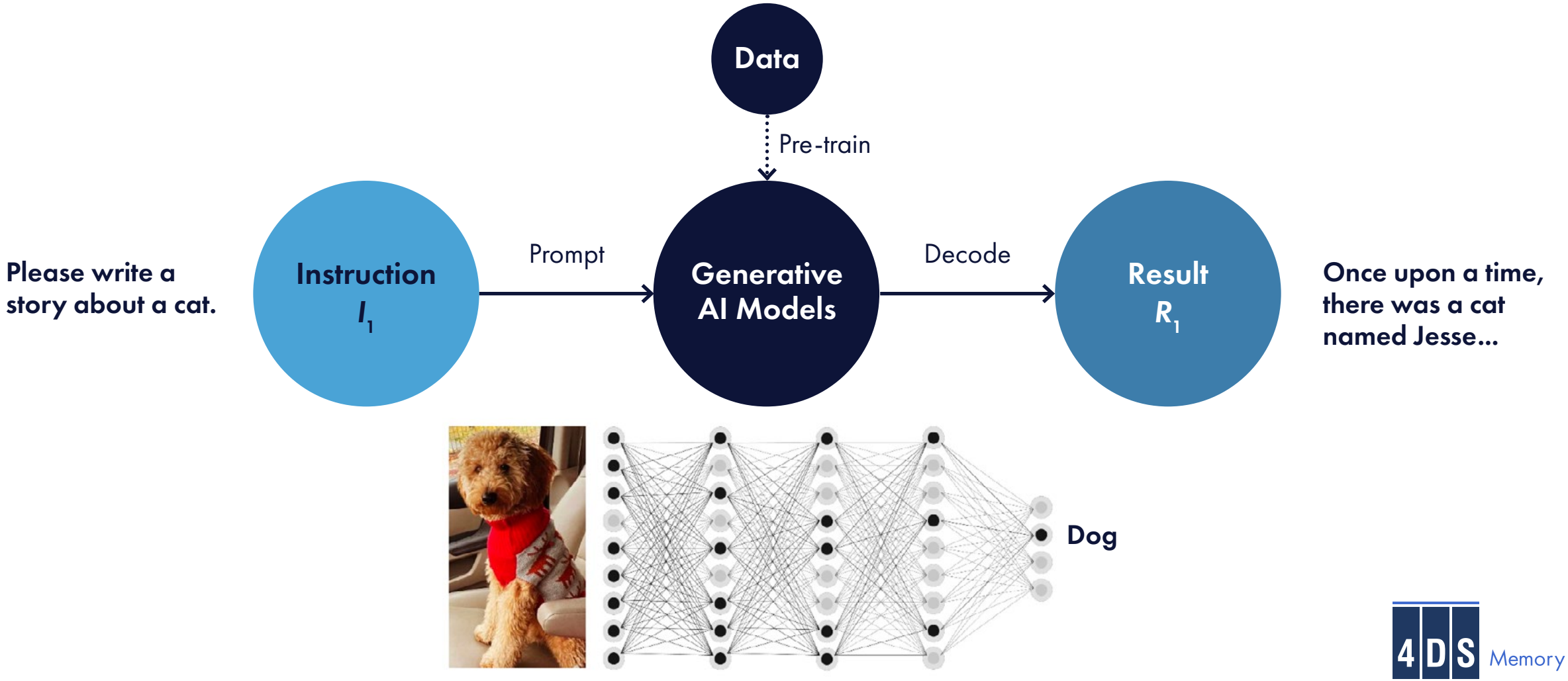
When the oxygen is present the cell conducts and is said to be SET

This is a reversible process, creating the on/off resistance states of the memory cell

Total current is a function of this oxygen distribution across the oxygen vacancies as determined by the one-shot programming

4DS Memory

AI is Driven by Deep Neural Nets



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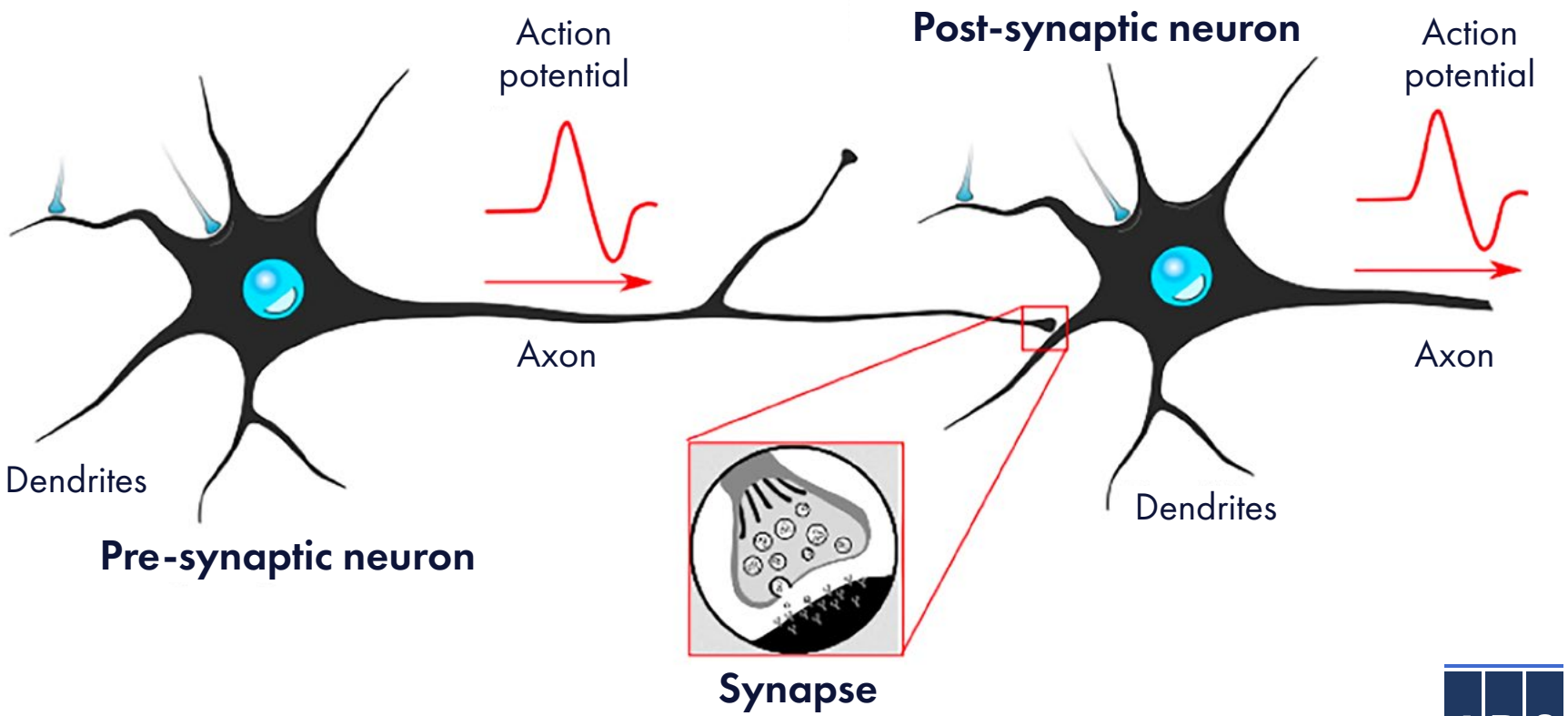
Neural Nets are an approach to modeling how the brain builds recognition and recall

They are a **Digital** approximation of the **Analog** process that goes on in the brain



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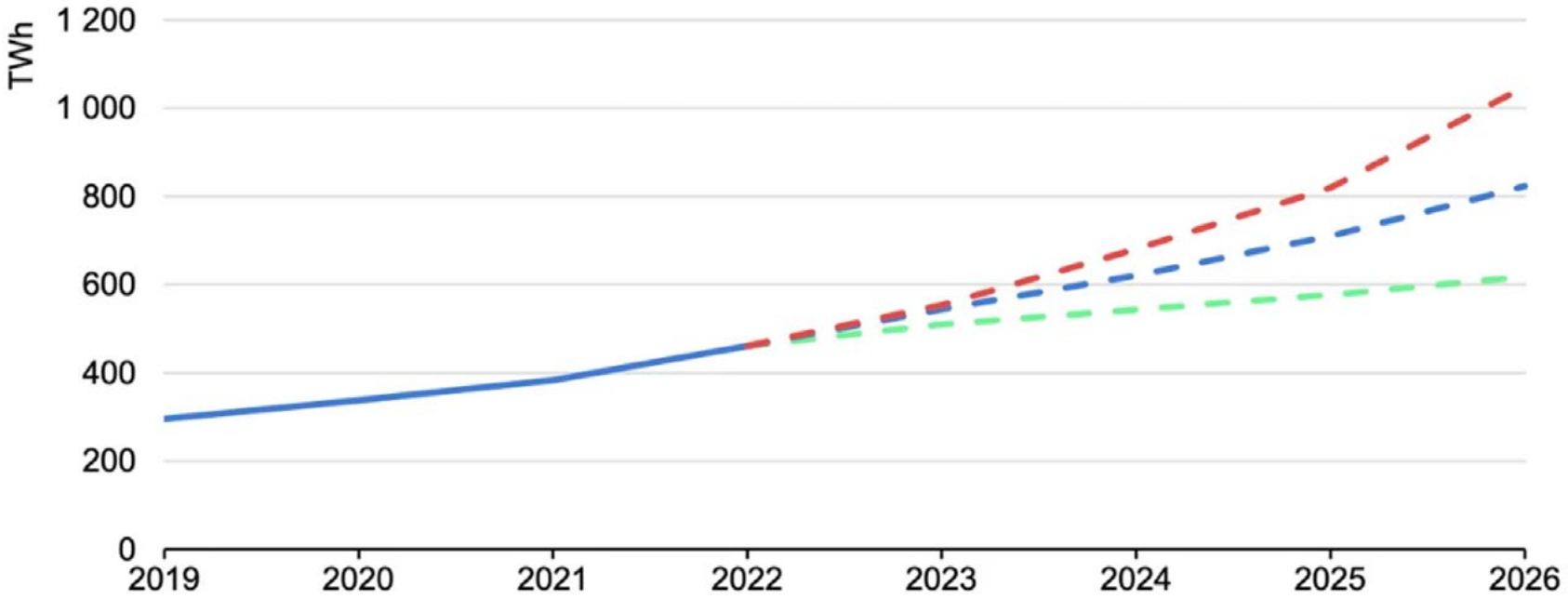
The energy cost of AI: 70-80% of the AI operations are due to the weighted calculations continued

The global demand for electricity may see a huge surge because of AI processing

- Low case
- Base case
- High case

Global electricity demand from data centres, AI, and cryptocrurencies, 2019-2026

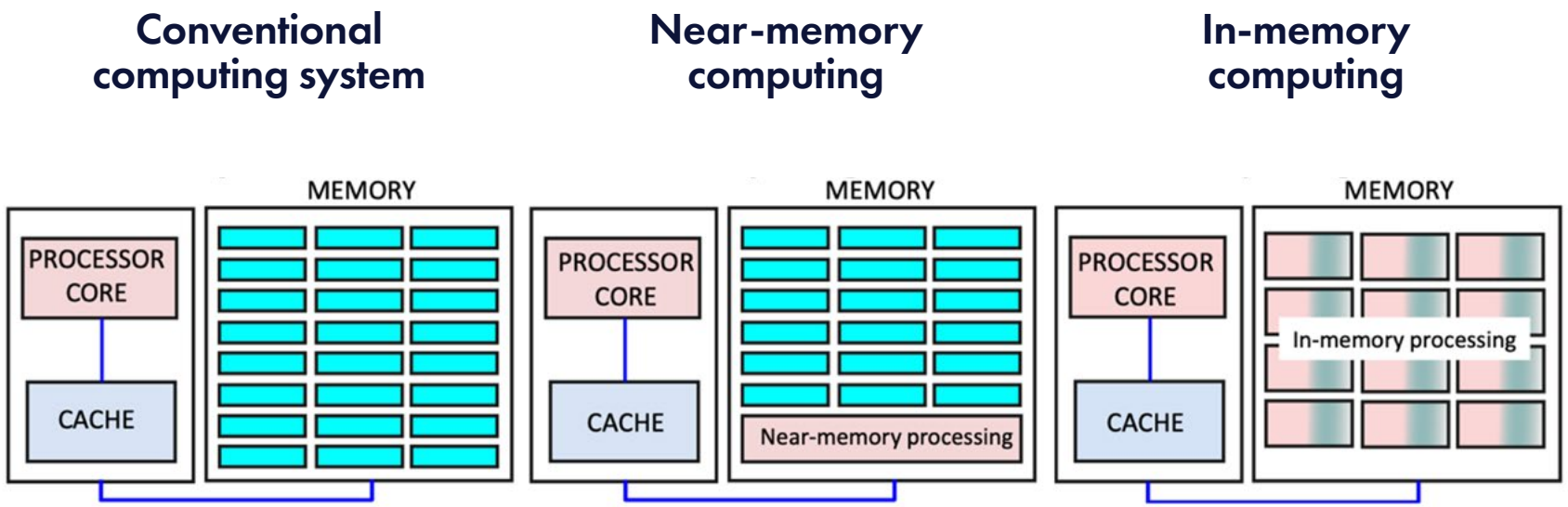


Notes: *Includes traditional data centres, dedicated AI data centres, and cryptocrurency consumption; excludes demand from data transmission networks. The base case scenario has been used in the overall forecast in this report. Low and high case scenarios reflect the uncertainties in the pace of deployment and efficiency gains amind future technological developments.*

Sources: Joule (2023). de Vries. *The growing energy footprint of AI: CCRI indices (carbon-ratings.com); The Guardian, Use of AI to reduce data centre energy use; Motors in data centres; The Royal Society, The future of computing beyond Moore's Law; Ireland Central Statistics Office, Data Centres electricity consumption 2022; and Danish Energy Agency, Denmark's energy and climate outlook 2018.*

A Major Driver for new AI architectures: Moving Memory Close to Central Processing Unit (CPU)

In-Memory Computing is the defining feature of all emerging AI engines



Sources: Mutlu et al., "A modern primer on processing in memory", (2022).

A need for a New Memory Solution Exists

"Difficult challenges gating development of beyond-CMOS devices include those related to memory technologies, information processing or logic devices, and heterogeneous integration of multi-functional components, a.k.a. More-than-Moore (MtM) or functional diversification.

One challenge is the need of a new memory technology that combines the best features of current memories in a fabrication technology compatible with CMOS process flow and that can be scaled beyond the present limits of SRAM and FLASH. This would provide a memory device fabrication technology required for both stand-alone and embedded memory applications. The ability of a chip to execute programs is limited by interaction between the processor and the memory, and scaling does not automatically solve this problem. The current evolutionary solution is to increase cache memory, thereby increasing the floor space that SRAM occupies on a chip. However, this trend eventually leads to a decrease of the net information throughput.

Volatility of semiconductor memory requires external long-term storage media that tend to be slow to access (e.g., magnetic hard drives, optical CD, etc.). **Therefore, development of electrically accessible non-volatile memory with high speed and high density would initiate a revolution in computer architecture. This development would provide a significant increase in information throughput beyond the traditional benefits of scaling.**"

Source: *IEEE, The International Roadmap for Devices and Systems: 2022, "Beyond CMOS", chapter 1.2.2. Emphasis added.*

4DS Memory

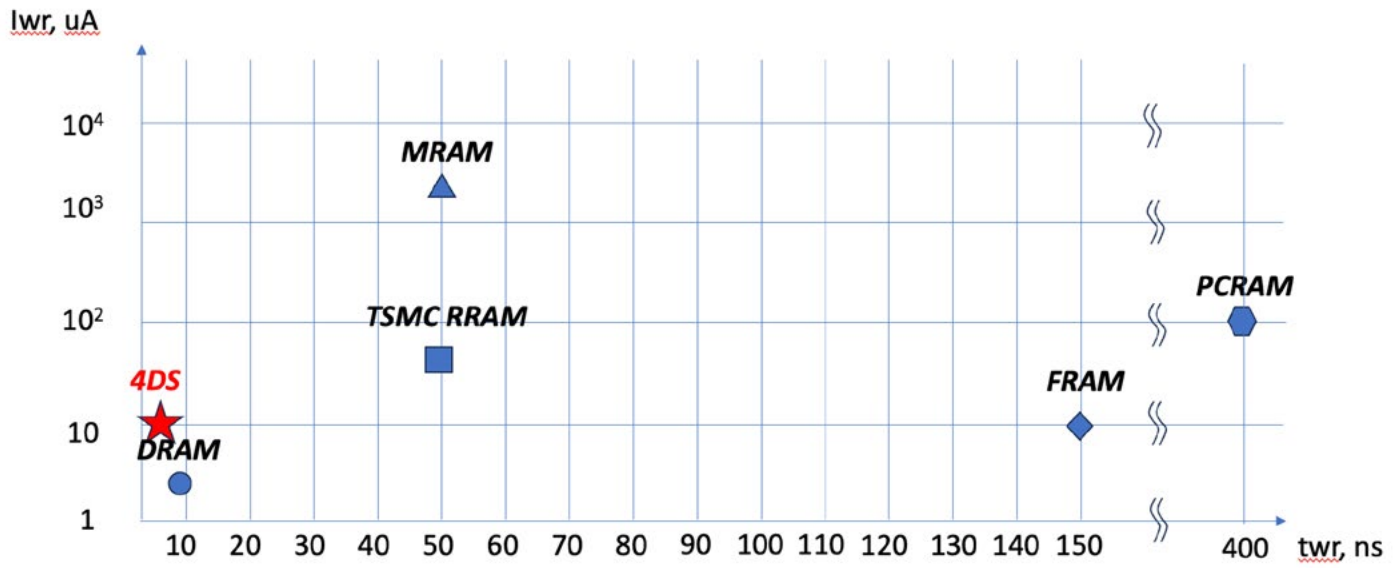
The Speed Advantages of 4DS Memory

4DS has demonstrated reliable, robust ReRAM programming with a single 4.7ns write pulse

This improves on our previously reported 9.5ns

The sub 5 nanosecond speeds are due to Electric Pulse Induced Resistance switching, which enables single shot programming in the 4DS cell

This switching is faster than the DRAM write window of 30ns and directly translates to lower energy per bit writing for the 4DS cell



Disclaimer: *these graphs are based on best publicly available data and may not reflect actual state of the art for each technology. The graph for the 4DS cell is estimated for the 20nm cell, based on scaling from 60nm actuals.*

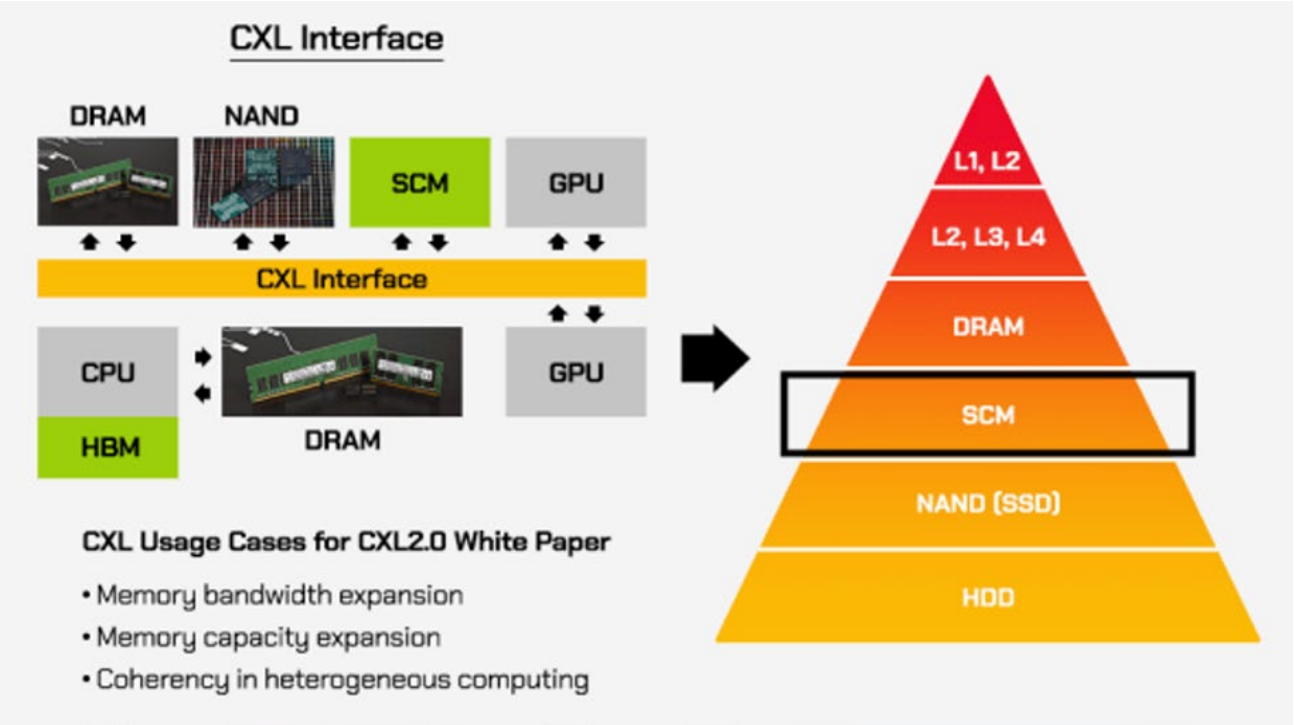
Why Important? Warm Data Applications

Advanced computing always needs DRAM for constant read and write (Hot Data), but emerging Inference Engines for AI need data at DRAM speeds that doesn't change over time (Warm Data)

Storage Class Memory – data storage that is peripheral to the main processing data but not in bulk storage – has consolidated behind CXL or Compute Express Link

This supports many classes of memory behind a standardized communications protocol

CXL is considered 'Slow' data when compared to DRAM



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4DS Memory

Corporate Summary

ASX Symbol: 4DS

Shares on Issue	1,762,834,918
Options on Issue	47,207,184
Cash on hand	~ $10M
Share price (22 April 2024)	$0.087
Market Cap (@ $0.087 share price)	$153M

Top 5 shareholders own 10.39% (at 22 April 2024)

Citicorp Nominees	3.36%
James Dorrian	2.57%
KZ 3 Pty Ltd	1.62%
Mr John Clement Cowie Love	1.52%
Mr Sam Huu Hai Nguyen	1.32%

4DS Memory 12 month share price graph

Board and Management

David McAuliffe
Executive Chairman

Experienced company director

Involved in numerous capital raisings and in-licensing of technologies

Founder of several companies in Australia, France and the UK, many of which are now ASX listed. Non-Executive Chairman of Invex Therapeutics Ltd

Dr Guido Arnout
Non-Executive Director

30+ years in commercialising electronics technology

Successes include Power-Escape, CoWare, CrossCheck Technology and Silvar-Liso

Howard Digby
Non-Executive Director

Former senior roles at IBM, Adobem Gartner and the Economist Group

Director of Cirralto Ltd, Elsight Ltd and Singular Health Ltd

Advisor to a number of technology companies

Ting Yen
Chief Technical Officer

30 years experience in commercialising memory technologies

Various roles at Integrated Memory, Netlogic, Integrated Device, Cypress, Paradigm and Philips Research

Peter Himes
Chief Strategic Officer

Experienced senior executive in high grown technology firms

Strong focus on innovation systems and strategic alliances

4DS:
THE RIGHT MEMORY FOR THE RIGHT MARKET AT THE RIGHT TIME

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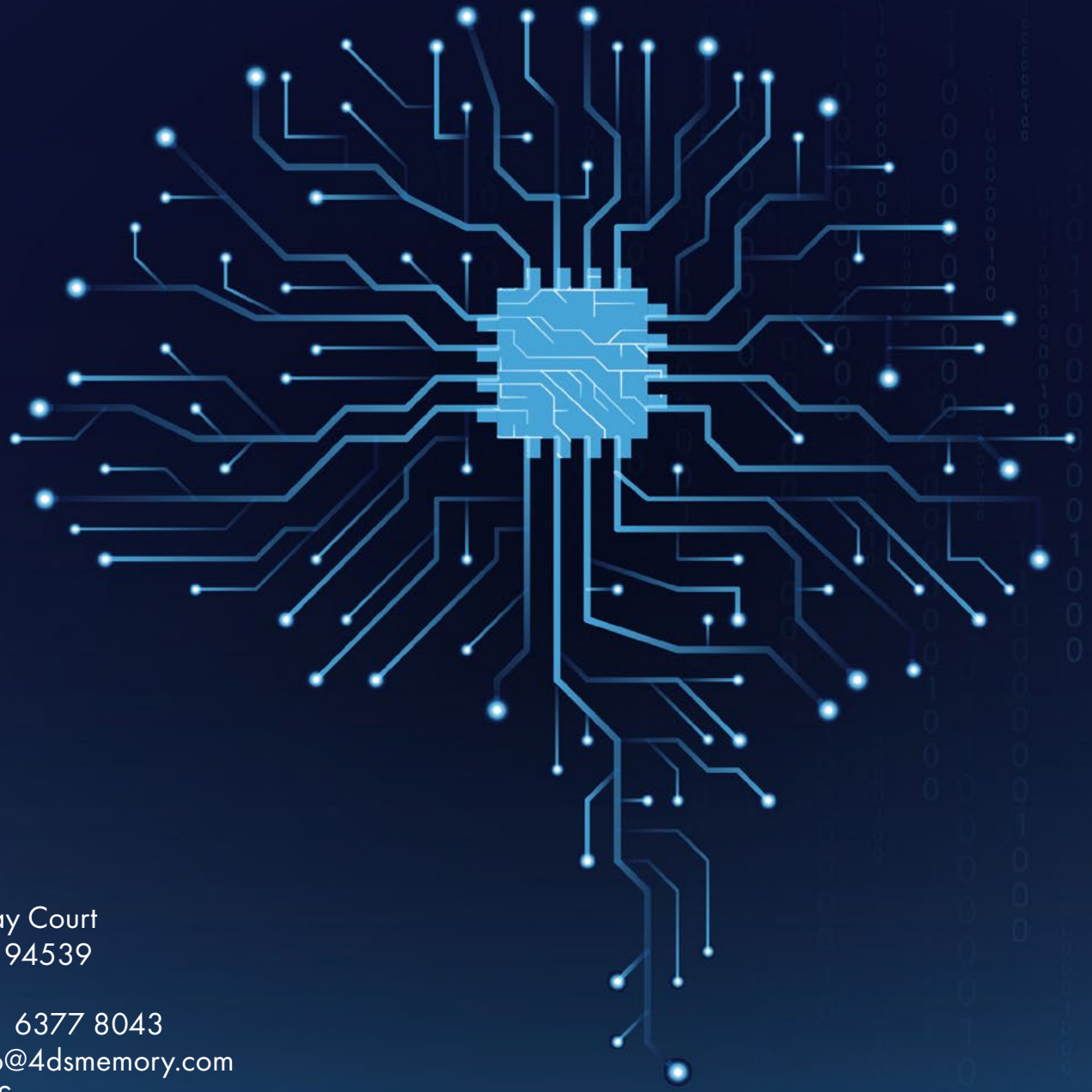

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