

THE IMPACT OF AI ON DATA CENTRE DESIGN

TEC FORUM MARCH 2024
NIEK VAN DER PAS

LEGRAND DATA CENTER SOLUTIONS

 legrand®

Who is presenting

Lead Data Centre Expert

Minkels - A brand of Legrand
Nov 1990 - Present · 33 yrs
Veghel

- Coordinator Europe, Data Centre Standards, Legrand
- Convenor of ISO/IEC JTC1/SC 39 WG 1: Resource Efficient Data Centres
- Vice chair of the 2022 TiC council Drafting Group for the Development of a Temporary Assessment Framework For Data Centre Activities based on the EU Taxonomy Climate Delegated Act addressing "Data processing, hosting and related activities"
- Member of the working group on the European Code of Conduct on Data Centre Energy Efficiency
- Chair of the Dutch Standards committee "NEN Normcommissie 381039 'Computerruimtes en datacenters' "
- NEN representative in CENELEC TC 215 "Electrotechnical Aspects of Telecommunication Equipment" WG 3 "Facilities and Infrastructures"
- NEN representative in ISO/IEC JTC1/SC 39 WG 3: Sustainable facilities and infrastructures
- NEN representative in IEC TC 48D: Mechanical structures for electronic equipment











A profile card for Niek van der Pas. The top half features a circular portrait of a man in a blue shirt against a background of server racks. To the right of the portrait is a blue pencil icon. Below the portrait, the name "Niek van der Pas" is displayed in a large, bold font. Underneath the name, the text "Data Centre Design ★ Data Centre Standards" and "★Legrand ★ White Papers" is shown in a smaller font. A blue pencil icon is also present in the bottom right corner of the card's content area.

Niek van der Pas
Data Centre Design ★ Data Centre Standards
★Legrand ★ White Papers



LEGRAND'S CSR APPROACH

The CSR strategy is driven by a CSR roadmap 2022-2024 and is based on four main areas of action to improve lives. These main areas guide and structure its commitments.

			
			
Promote diversity and inclusion	Reduce our carbon footprint	Develop a circular economy	Be a responsible business

2030 TARGETS



activities by **50%** and reduce carbon emissions in our value chain by **15%**



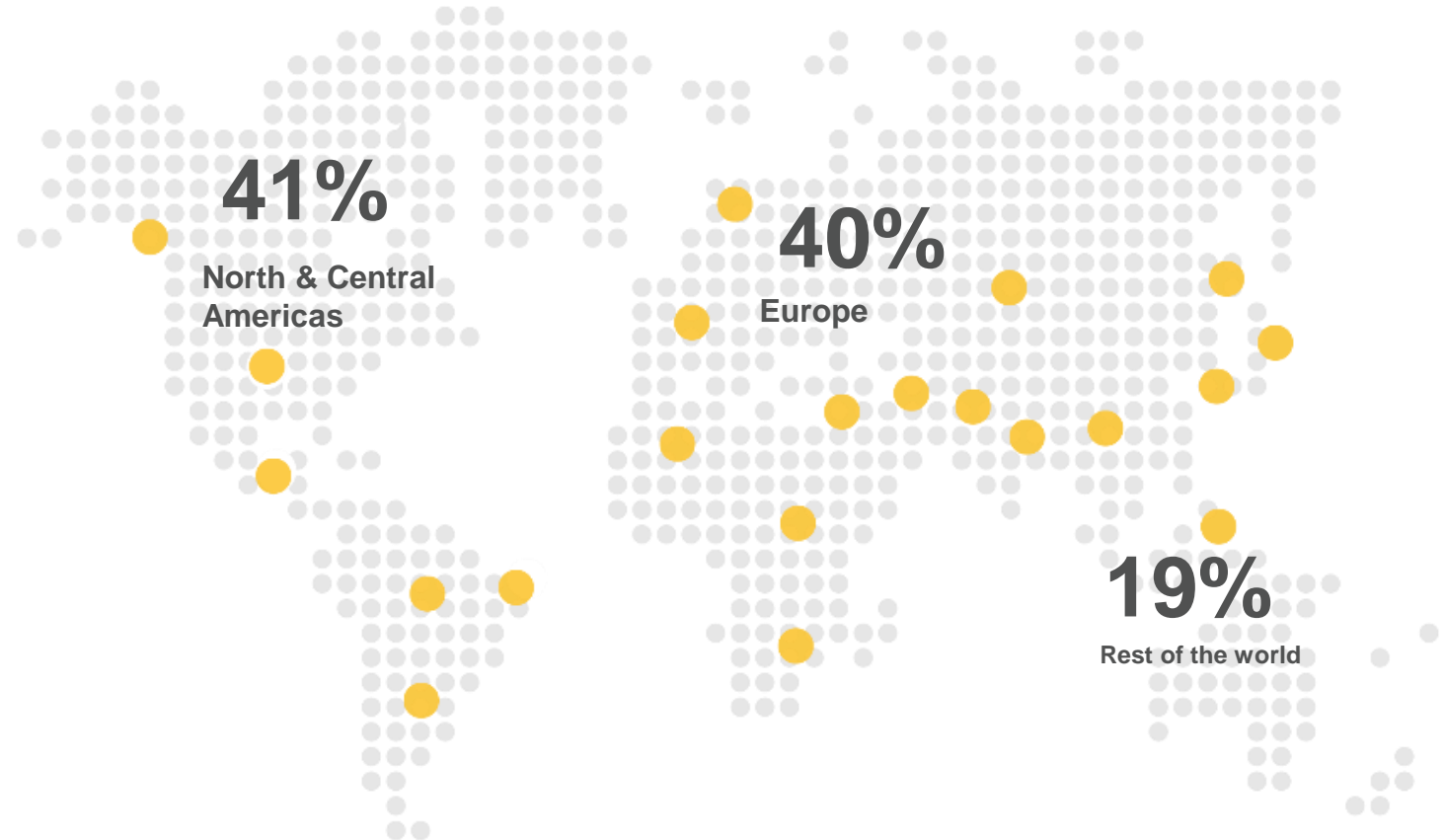
Achieve **80%** of our sales with eco-responsible solutions



50/50 Achieve gender parity across the Legrand group's workforce
Women in **1/3** of key positions



TURNOVER BY GEOGRAPHIC AREA



THE GROUP IN FIGURES

In 2022

Close to
8.3B€ turnover

Present on
5 continents

More than
38 000 employees

Located
90 countries

CSR Achievement rate
123%

Distributed in
170 countries



legrand®

Complete global solutions for digital and electrical infrastructure.

BORRI

Specialist in UPS for industrial applications and datacenters.

CABLOFIL

Using its global strength and market leading position, Cablofil has developed a complete range of cable management solutions.

COMPOSE

Specialist in passive data communication solutions, cabling of data centers, buildings and fiber optic infrastructures.

Raritan

Proven leader of intelligent PDUs, transfer switches, environmental sensors, serial consoles and KVM-over-IP Remote Access switches.

Server Technology

Leading specialist in customer-driven power, access and control solutions for monitoring and managing critical IT assets.

Starline

Starline has grown to become a global leader in busbar power distribution equipment

USystems

USystems provide cooling products that enhance data center cooling, providing these to global businesses, making their data centers more environmentally friendly.

GEIGER

Data center fiber optic infrastructures, data center design and DCIM (monitoring & management) service and implementation.

MINKELS

Turn-key hot/cold aisle containment and enclosures for data center infrastructures.

modulan

Provider of fully customizable containment solutions. Maximum flexibility to cover customer needs.

PowerControl

A leading provider of uninterruptible power supply (UPS) solutions, trusted by businesses worldwide to protect their critical power loads and avoid unplanned business downtime.

VOLTADIS

Voltadis offers support in electrical power supply systems for data centers' grey rooms including design, commissioning, equipment supply, and installation.

ZUGCHINI

Zucchini has become a leading brand of cast resin transformers, offering one of the most comprehensive ranges on the market.

CRITICAL POWER



CAST RESIN TRANSFORMERS

HIGH POWER BUSBAR

UPS & STS SOLUTIONS

DMX3 ACB & DPX3 MCCB

BUSWAYS

CABLE MANAGEMENT



OVERHEAD CABLE MANAGEMENT

EZ-PATH FIRE RESISTANT CABLE DUCT

IT INFRASTRUCTURE



CONTAINMENT AND COOLING

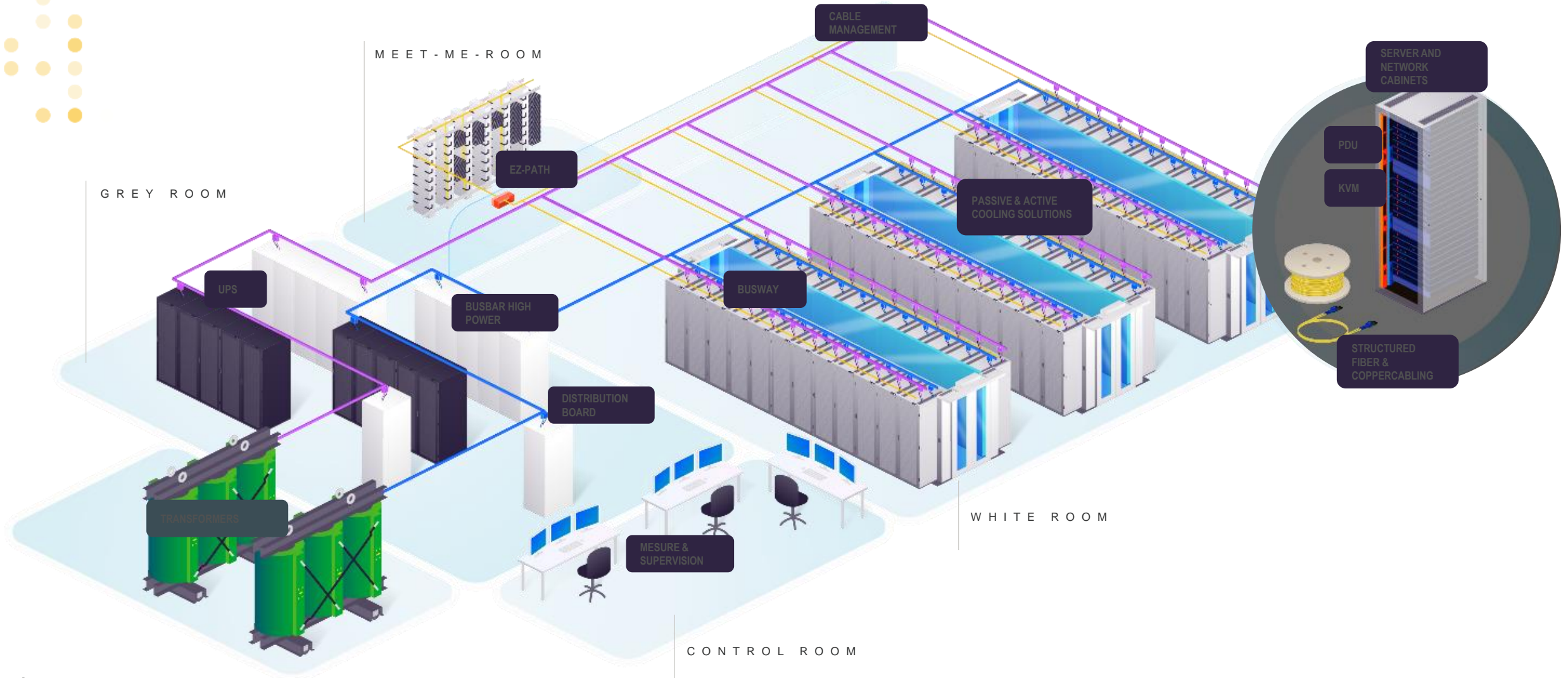
SERVER AND NETWORK CABINETS

INTELLIGENT PDU'S AND SENSORS

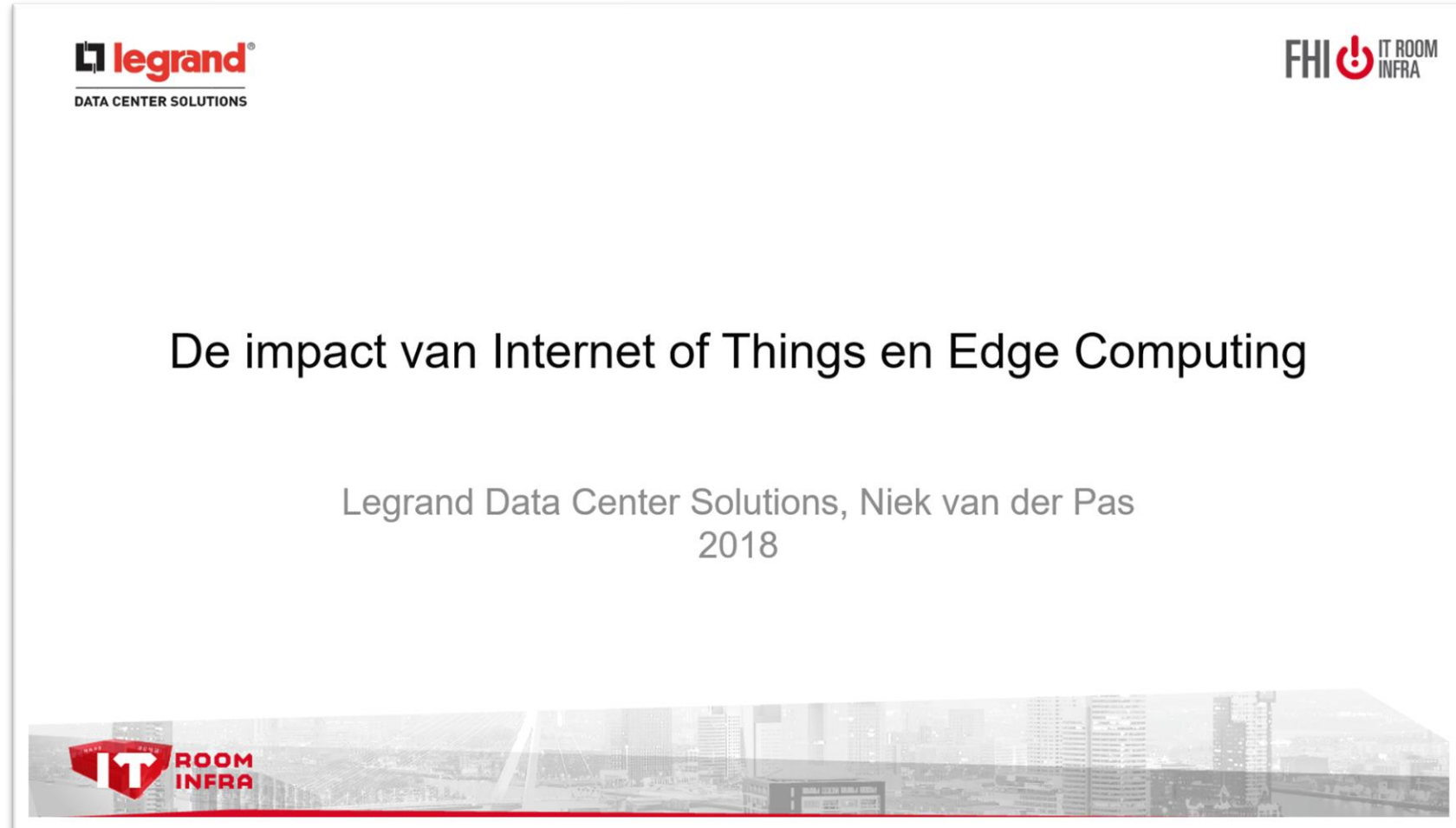
KVM & SERIAL CONSOLE

STRUCTURED FIBER AND COPPER CABLING


DCIM SOFTWARE INTEGRATION




Looking back 5 Years




The slide features a white background with a thin red border. At the top left is the Legrand Data Center Solutions logo. At the top right is the FHI IT ROOM INFRA logo. The main title is centered in a large black font. Below the title, the author and year are listed in a smaller grey font. At the bottom, there is a wide, semi-transparent image of a city skyline at night with a red horizontal bar overlaid on the left side containing the IT ROOM INFRA logo.


DATA CENTER SOLUTIONS



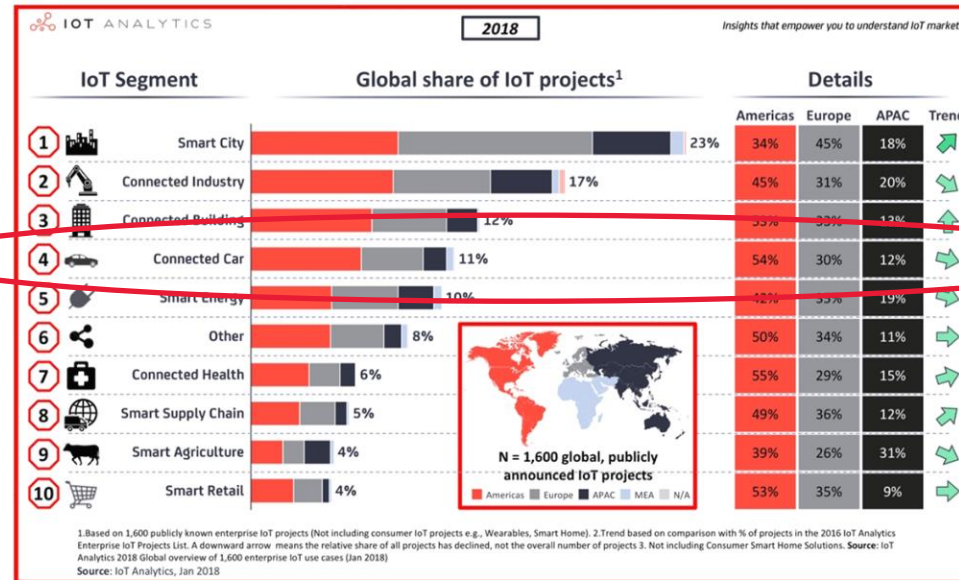
De impact van Internet of Things en Edge Computing

Legrand Data Center Solutions, Niek van der Pas
2018




Looking back 5 Years What is the Edge

Wat stuurt de Edge




Source: IOT Analytics

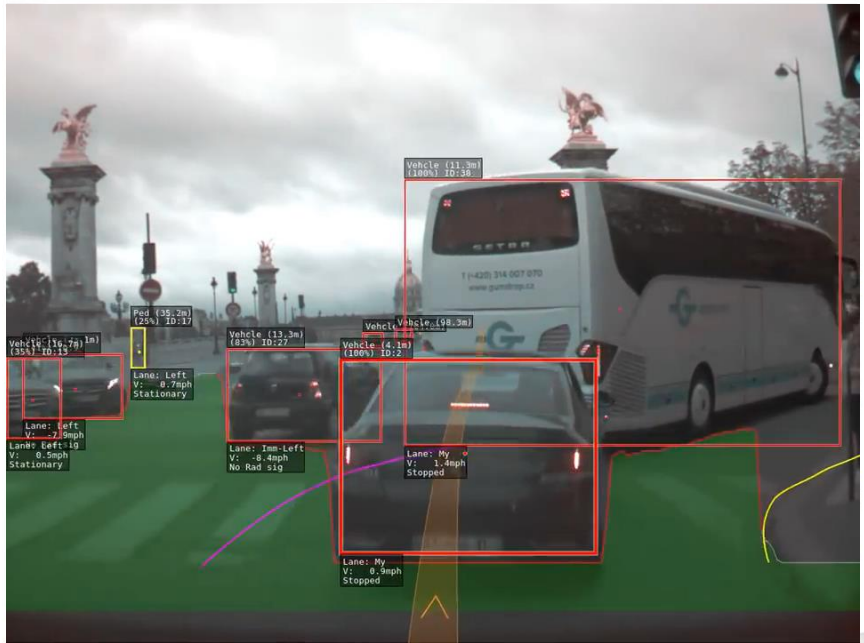
Looking back 5 Years **What is the Edge**



DATA CENTER SOLUTIONS

Zelfrijdende auto's


























Source: [Youtube](#)


The 5 levels of driving automation

For on-road vehicles

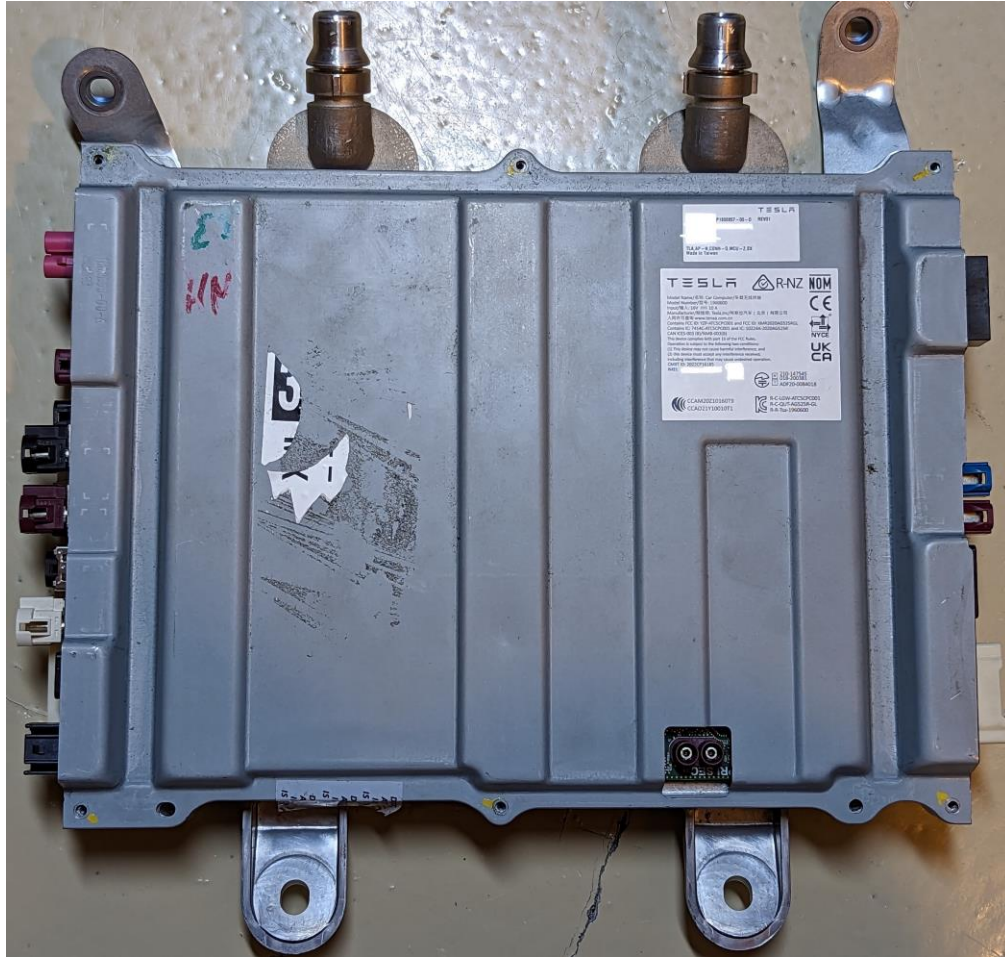
		Human driver	Automated system		
					
		Steering and acceleration/ deceleration	Monitoring of driving environment	Fallback when automation fails	
Human driver monitors the road	0 NO AUTOMATION				N/A
	1 DRIVER ASSISTANCE				SOME DRIVING MODES
	2 PARTIAL AUTOMATION				SOME DRIVING MODES
Automated driving system monitors the road	3 CONDITIONAL AUTOMATION				SOME DRIVING MODES
	4 HIGH AUTOMATION				SOME DRIVING MODES
	5 FULL AUTOMATION				

Source: SAE International

Vox



Looking back 5 Years **What is the Edge**



Tesla
model Y
Computer



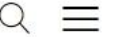
Tesla
model Y
4G
Antenna

Artificial Intelligence will become a dominant IT driver



Google Calls In Help From Larry Page and Sergey Brin for A.I. Fight

A rival chatbot has shaken Google out of its routine, with the founders who left three years ago re-engaging and more than 20 A.I. projects in the works.



The Age of AI has begun

Artificial intelligence is as revolutionary as mobile phones and the Internet.

By **Bill Gates** | March 21, 2023 • 14 minute read



Artificial Intelligence will become a dominant IT driver

marketsandmarkets.com/Market-Reports/artificial-intelligence-market-74851580.html



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KNOWLEDGE STORE REPORTS RESEARCH INSIGHT RESOURCE CENTER EVENTS 360 QUADRANTS

Instant Answers with GPT - Ask Now!

Ask real questions. Get complete answers !

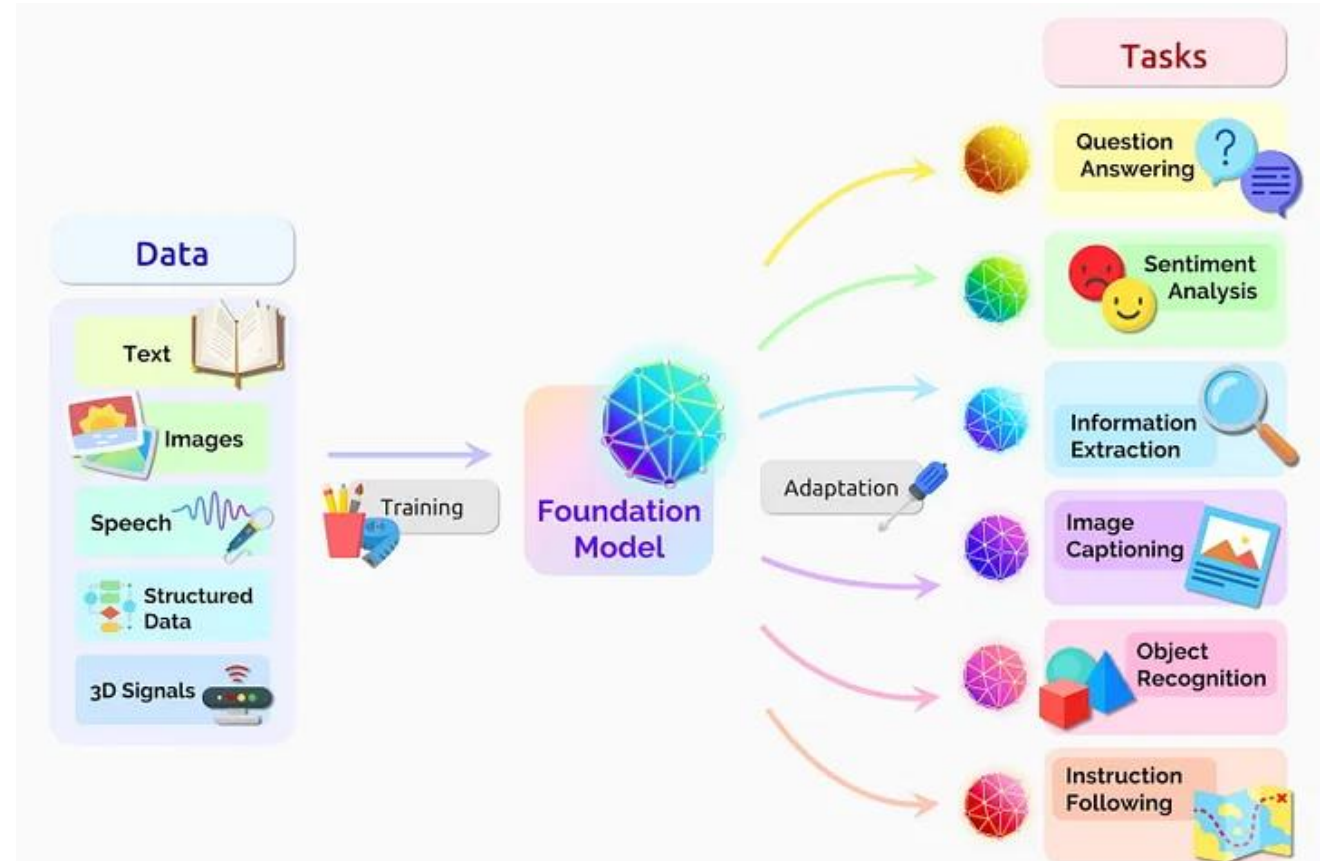
Can you give an insight in the AI market expectations

The AI market is expected to experience significant growth in the coming years. According to MarketsandMarkets, the AI market is projected to reach USD 407.0 billion by 2027, at a CAGR of 36.2% during the forecast period. The growth of the market is driven by the increasing adoption of cloud-based applications and services, big data, and the growing demand for intelligent virtual assistants. However, the limited number of AI technology experts and data privacy and unreliability of AI algorithms are some of the key restraints to the market. The underlying opportunities in the AI market include improving operational efficiency in the manufacturing industry and the adoption of AI to improve customer service. According to MarketsandMarkets, the global Artificial Intelligence (AI) market is expected to grow significantly in the coming years. The market is driven by factors such as increasing demand for AI-based solutions in various industries, growing investments in AI, and increasing adoption of cloud-based AI solutions. Additionally, the increasing demand for AI-based solutions in the healthcare industry is expected to further drive the growth of the AI market. Furthermore, the increasing demand for AI-based solutions in the automotive industry is expected to create lucrative opportunities for the AI market.

Load More...

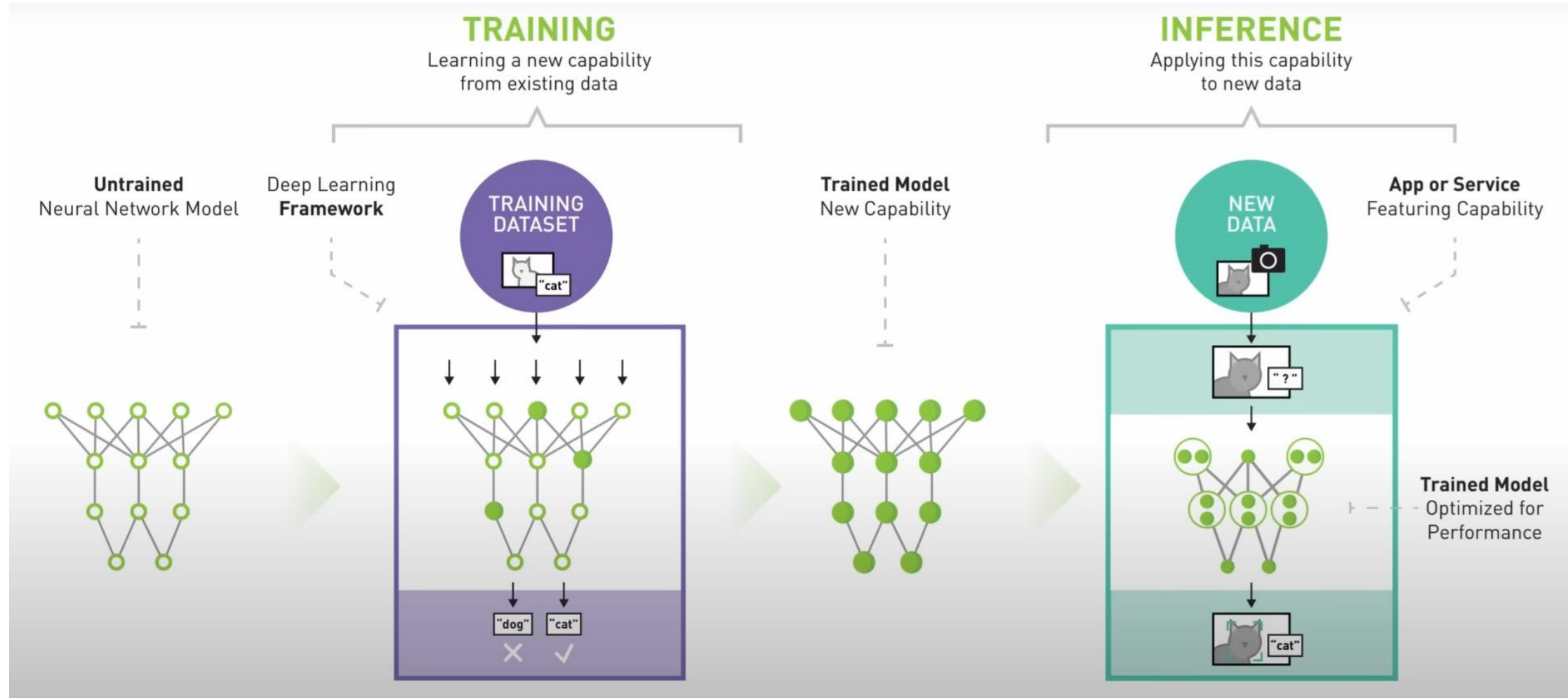
Type Your Question

Artificial Intelligence will become a dominant IT driver



Source: knowledgezone.co.in

Artificial Intelligence will become a dominant IT driver



Where does Artificial Intelligence live

CUSTOM CDU DELIVERED 2021 1ST DOJO CABINET INSTALL 2022

CUSTOM COOLING DISTRIBUTION UNIT (CDU) FIRST INTEGRATED DOJO CABINET 2.2 MW LOAD BANK TESTING

2.2 MW LOAD TESTING

TESLA LIVE

legrand DATA CENTER SOLUTIONS FHI IT ROOM INFRA

Zelfrijdende auto's

The 5 levels of driving automation

For on-road vehicles

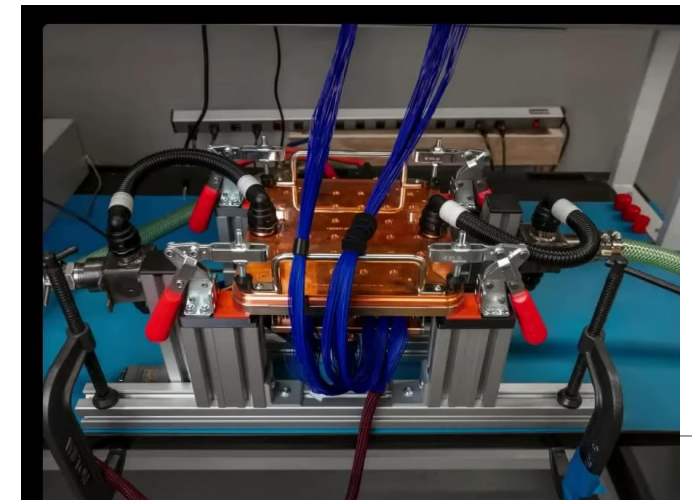
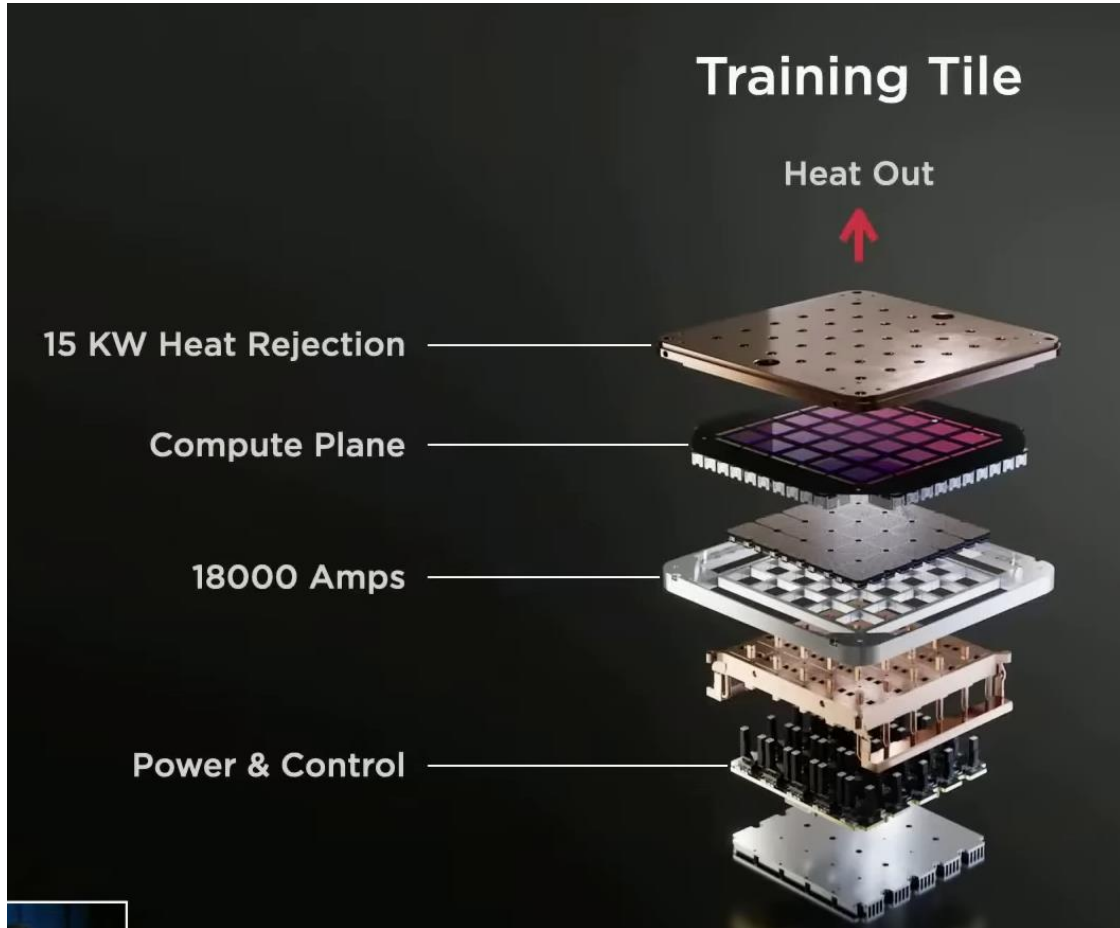
Level	Steering and acceleration of driving	Monitoring of driving environment	Fallback when automation system is lost	Automated system
0 NO AUTOMATION	Driver	Driver	Driver	None
1 DRIVER ASSISTANCE	Driver	Driver	Driver	Lane-keeping, Adaptive cruise control
2 PARTIAL AUTOMATION	Driver	Driver	Driver	Lane-keeping, Adaptive cruise control, Automatic emergency braking
3 CONDITIONAL AUTOMATION	Driver	Driver	Driver	Lane-keeping, Adaptive cruise control, Automatic emergency braking, Traffic jam assist
4 HIGH AUTOMATION	Driver	Driver	Driver	Lane-keeping, Adaptive cruise control, Automatic emergency braking, Traffic jam assist, Cross-traffic alert
5 FULL AUTOMATION	None	None	None	Full driving automation

Source: SAE International

ROOM INFRA Vox



Tesla and AI

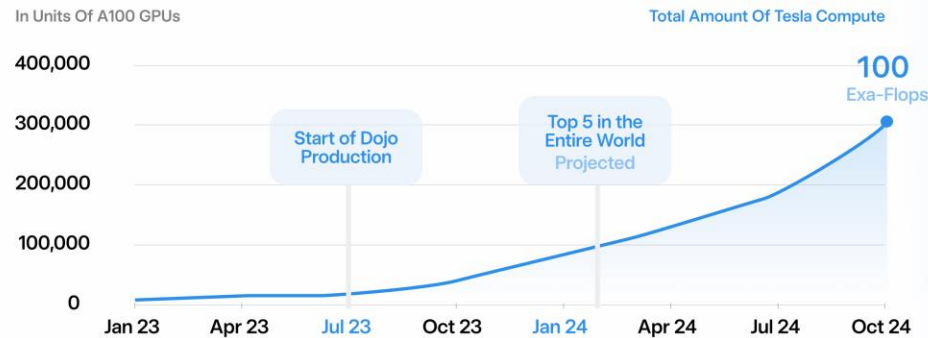


Tesla and AI



Tesla Owners Silicon Valley @teslaownersSV · Jun 21
Exponential improvement coming to FSD Beta once Dojo is up and running.

Trained On Extremely Large Compute



Elon Musk @elonmusk · Jun 21
Subscribed
Replying to @teslaownersSV
I should clarify that Dojo V1 is highly optimized for vast amounts of video training vs general purpose AI. Dojo V2 will address these limitations.



Tesla AI @Tesla_AI · Jun 21
Replying to @Tesla_AI
These models will learn from a huge set of extremely diverse data from the Tesla fleet



0:16 32 190 2,053 149.9K 18

Tesla and AI



Tweet

Penny2x @imPenny2x · Jun 22
No big deal, Tesla is just going live with an Nvidia competitor soon.

Elon Musk @elonmusk
Not exactly a competitor to Nvidia, as we aren't selling Dojo computers (although it could be sold as service).
We just need a crazy amount of training compute to get full self-driving 10X safer than human, but can't get enough GPUs, plus prices are extremely high!

12:31 AM · Jun 22, 2023 · 2M Views

757 Retweets 104 Quotes 11.3K Likes 184 Bookmarks



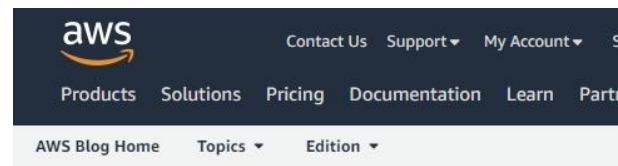
Artificial Intelligence will become a dominant IT driver

Enterprise AI Hardware Portfolio

IC922 is a significant market addition enabling an end-to-end solution for AI and cloud



AI Hardware: Overview of Edge Machine Learning Inference in 2022



AWS Machine Learning Blog

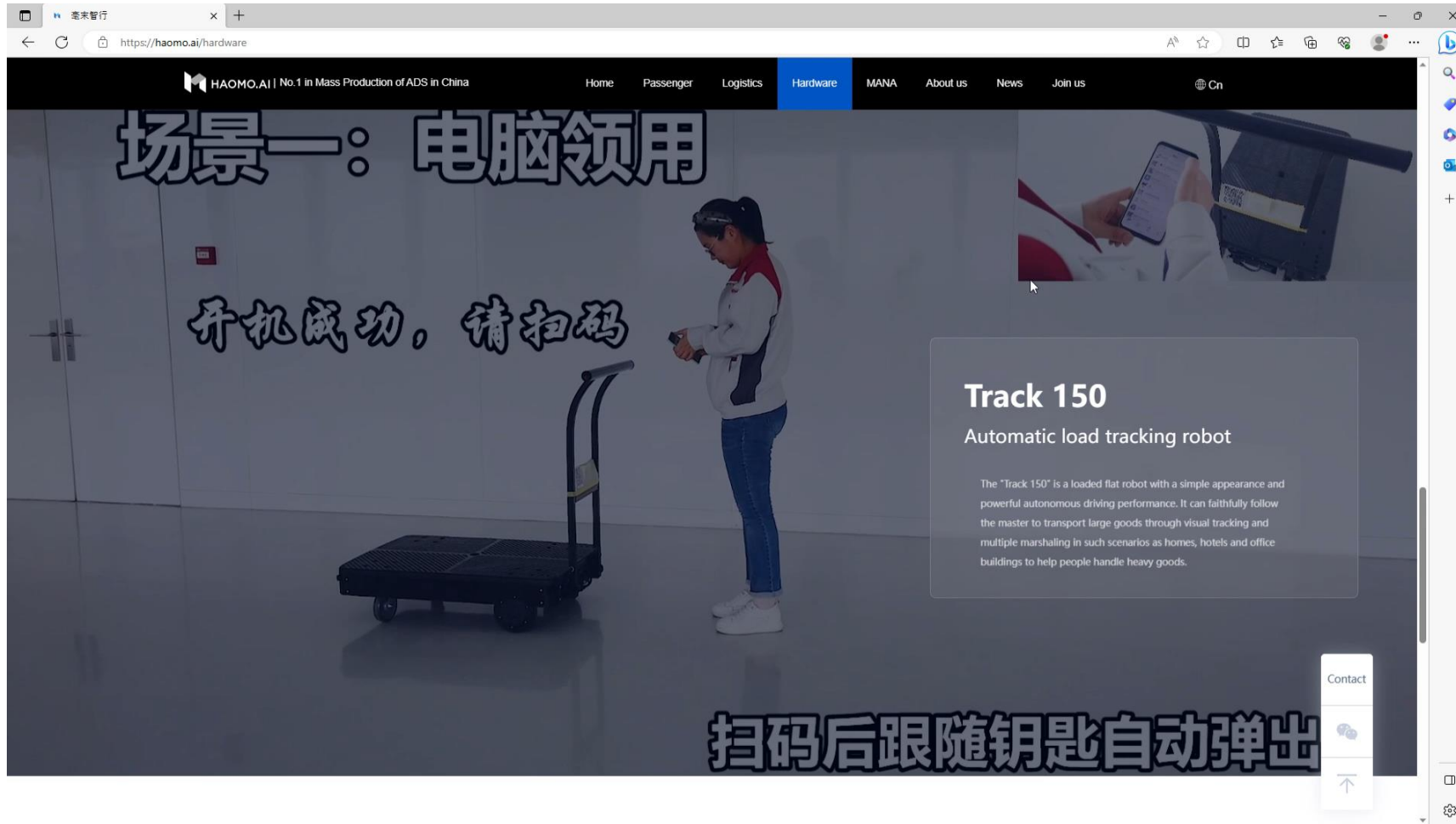
Deploy pre-trained models on AWS Wavelength with 5G edge using Amazon SageMaker JumpStart

Products

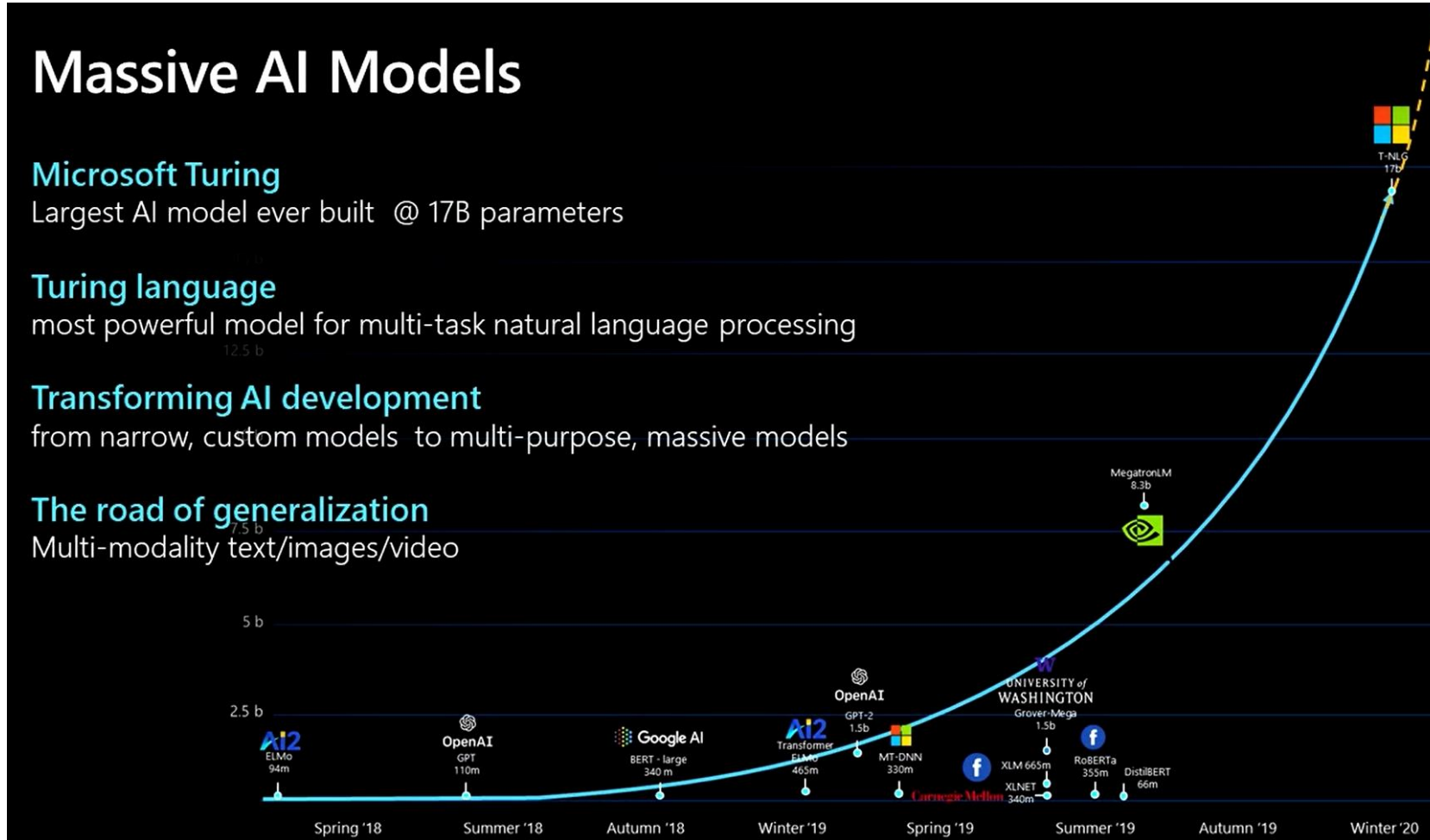
Helping you bring local AI to applications from prototype to production



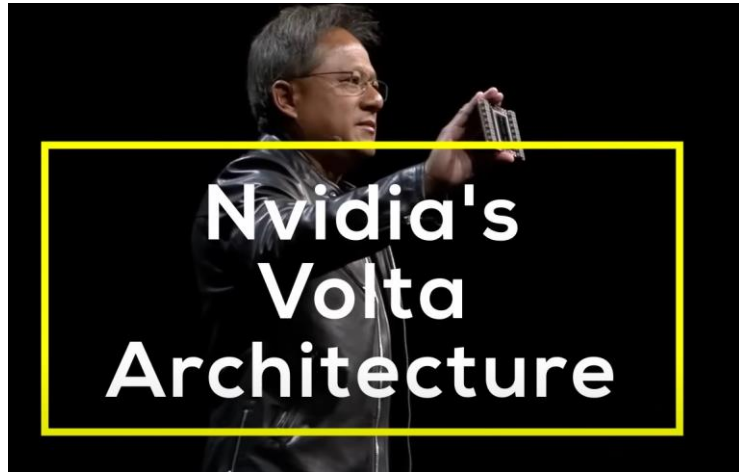
Where does Artificial Intelligence live



Artificial Intelligence will become a dominant IT driver



Artificial Intelligence will become a dominant IT driver

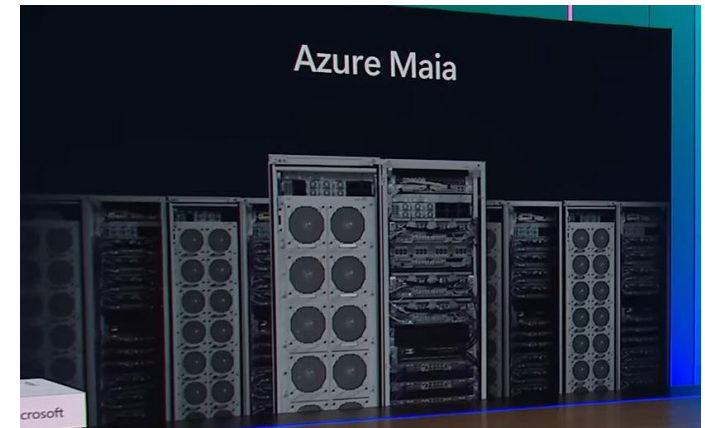
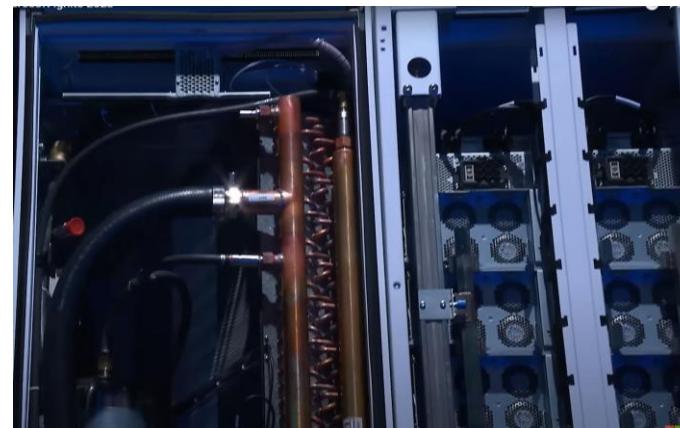
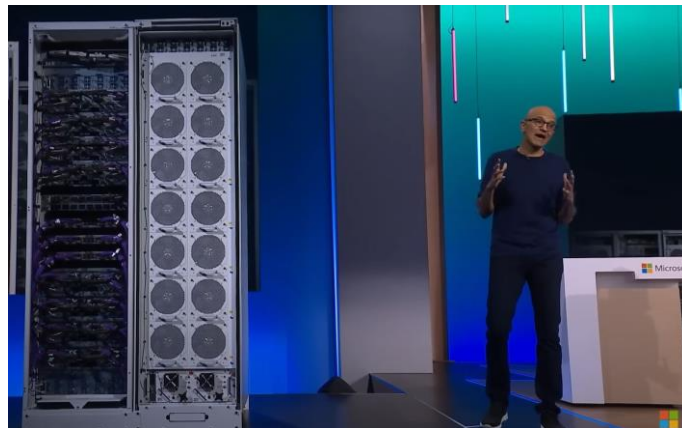
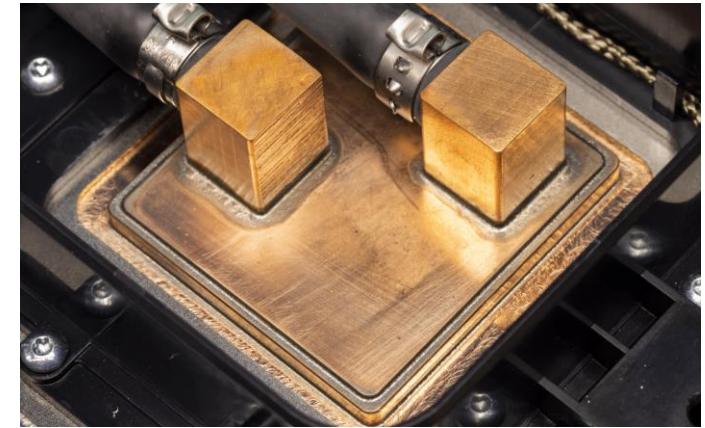
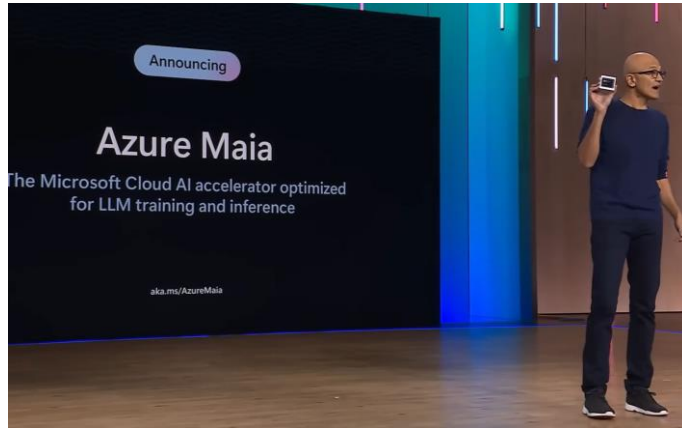


GP100	GV100
15.3bn transistors	21.1bn transistors
610mm ² @ TSMC 16nm	815mm ² @ TSMC 12nm
3,584 CUDA-cores	5,120 CUDA-cores
10.6 TFLOPS FP32	15 TFLOPS FP32
	640 Tensor-cores
	125 TFLOPS FP16

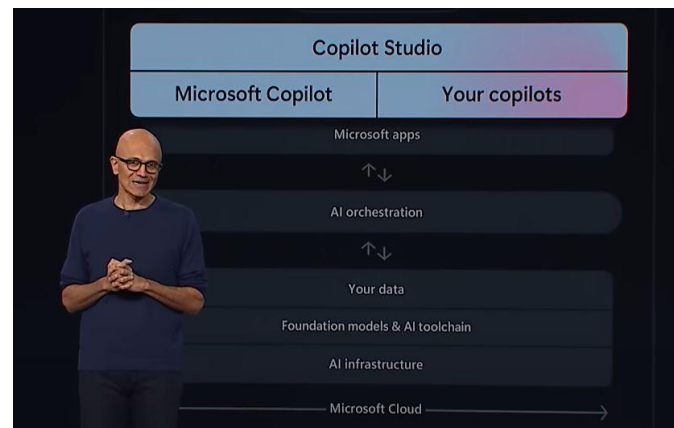
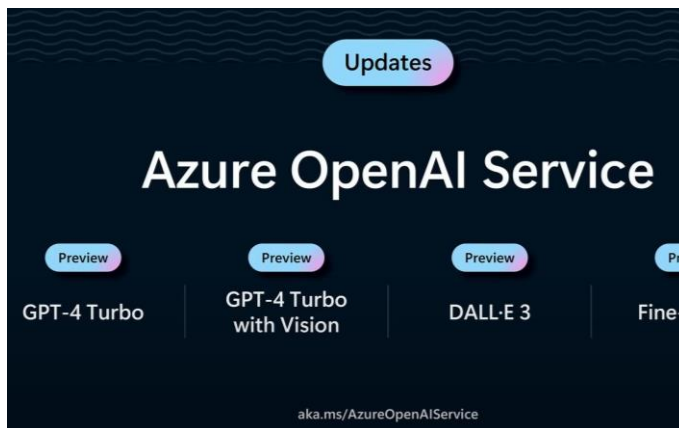
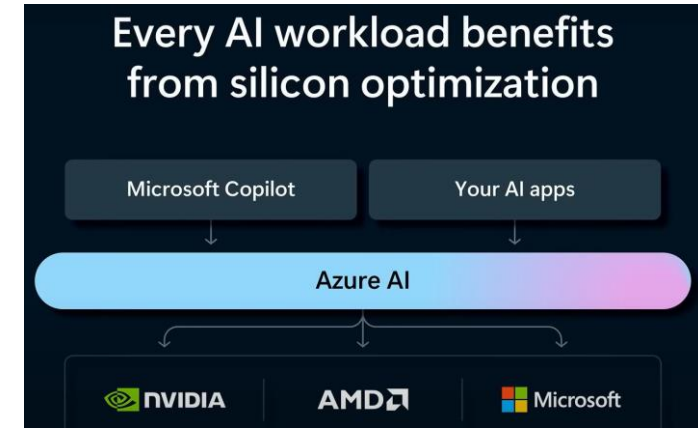
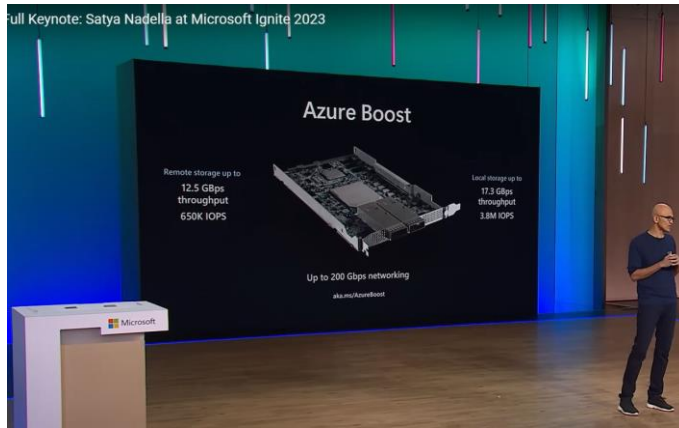
Two Nvidia GPUs, GP100 and GV100, are shown against a green background with a network diagram. The GP100 is on the left and the GV100 is on the right. Below each GPU is a list of specifications.



Artificial Intelligence will become a dominant IT driver



Artificial Intelligence will become a dominant IT driver

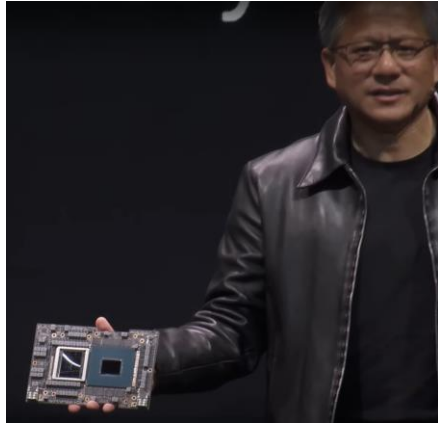


TOP 500 The List

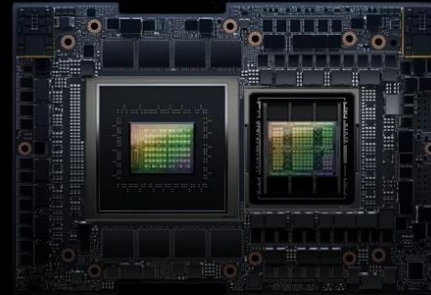
November 2023

1	Frontier, HPE 1,194.00 PFlop/s	6	Leonardo, EVIDEN 238.70 PFlop/s
2	Aurora, Intel 585.34 PFlop/s	7	Summit, IBM 148.60 PFlop/s
3	Eagle, Microsoft Azure 561.20 PFlop/s	8	MareNostrum 5 ACC, EVIDEN 138.20 PFlop/s
4	Supercomputer Fugaku, Fujitsu 442.01 PFlop/s	9	Eos NVIDIA DGX SuperPOD, NV 121.40 PFlop/s
5	LUMI, HPE 379.70 PFlop/s	10	Sierra, IBM / NVIDIA / Mellanox 94.64 PFlop/s

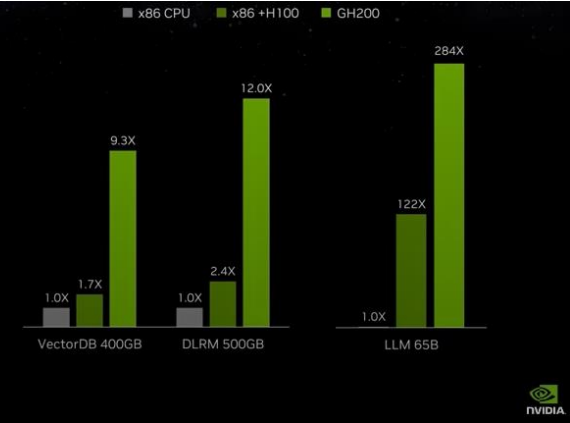
Where does Artificial Intelligence live in the future



NVIDIA GH200 GRACE HOPPER SUPERCHIP
NOW IN PRODUCTION
The Engine for the Generative AI Era



4 PetaFLOPS TE | 72 Arm CPUs | 96GB HBM3 | 576GB GPU Memory



INTRODUCING MGX
Open Modular Server Design for Accelerated Computing

Multi-Generation Standardized for TTM and Improved ROI

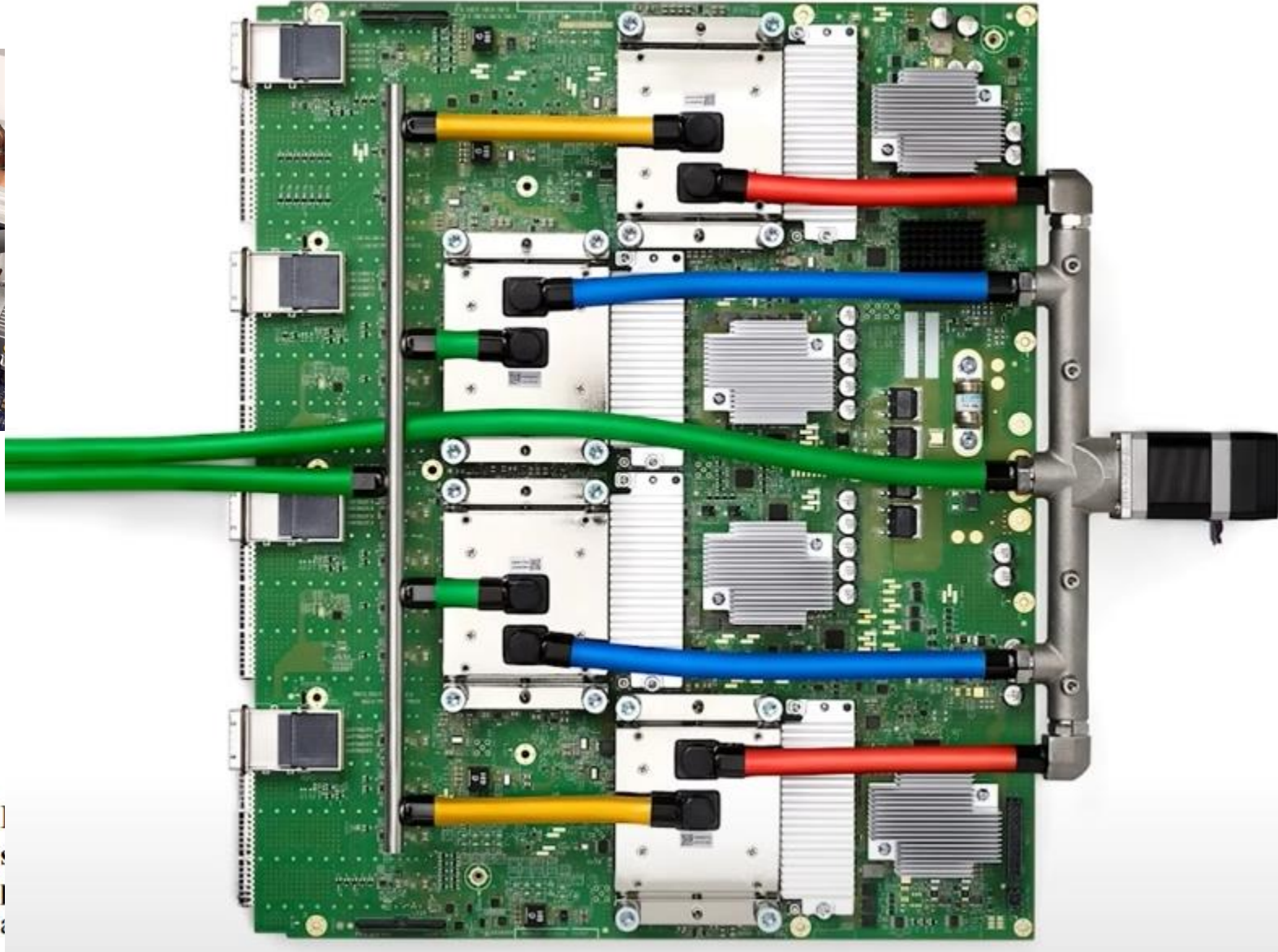
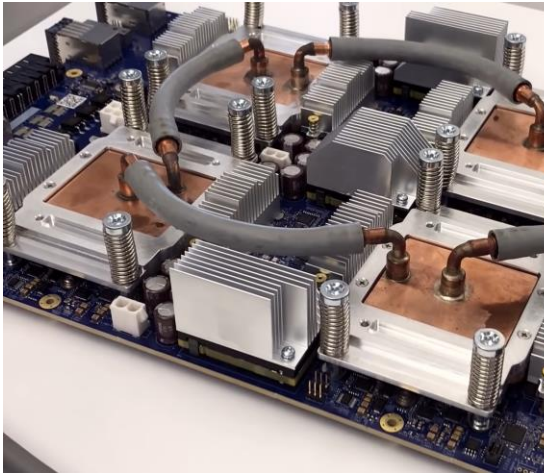
Configurable into 100s of Solutions

Integrates into Cloud and Enterprise Data Centers

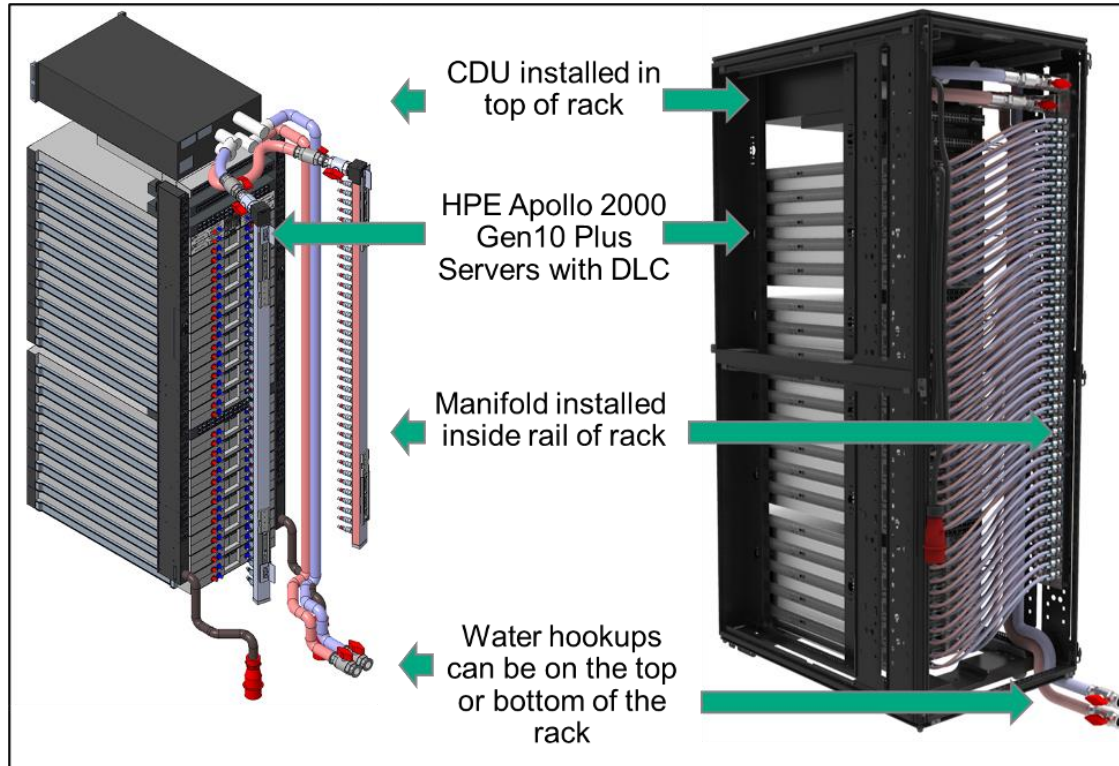
1 GPU

Grace Hopper Liquid-Cooled Server for HPC
1U | 2 Grace Hopper | 2 BF-3 | 4 PCIE

Artificial Intelligence will become a dominant IT driver



Artificial Intelligence will become a dominant IT driver

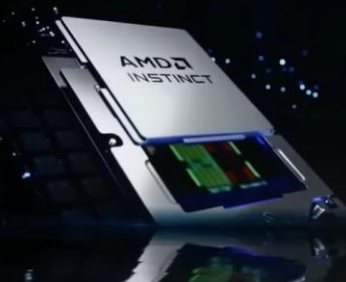


147bn



>10,000 CDN3 GPU cores
24 Zen 4 CPU cores
lots of I/O (CLX 3.0)
Infiniy Cache
128GB HBM3

AMD MI300



World's First Integrated Data Center CPU + GPU
AMD INSTINCT™ MI300
Breakthrough architecture to power the exascale AI era

Where does Artificial Intelligence live

Executive Summary

This document is not a specification for OAI/OAM products. It is a set of guidelines on design, validation and implementation of liquid cooling solutions for AI Training Systems with 8x OAM products or others like



OCP OAI SYSTEM LIQUID COOLING

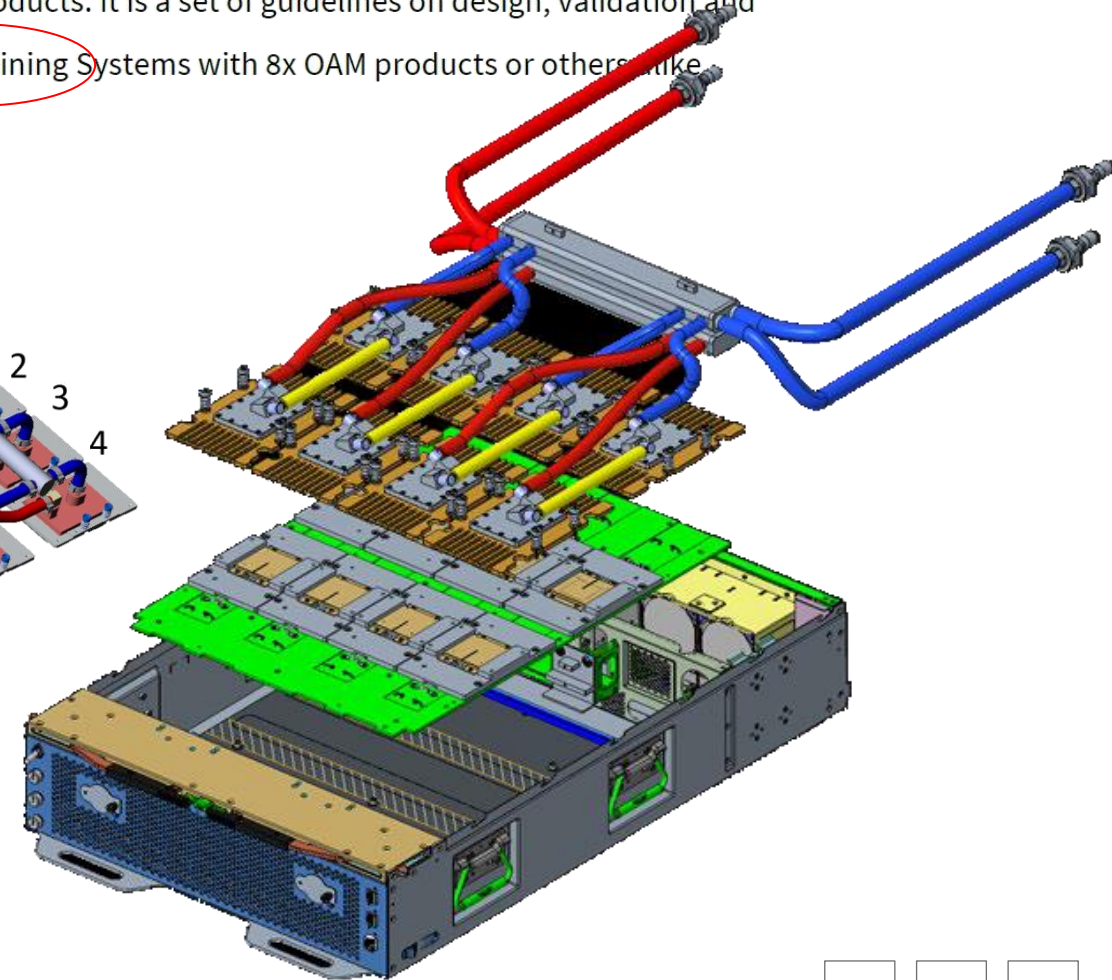
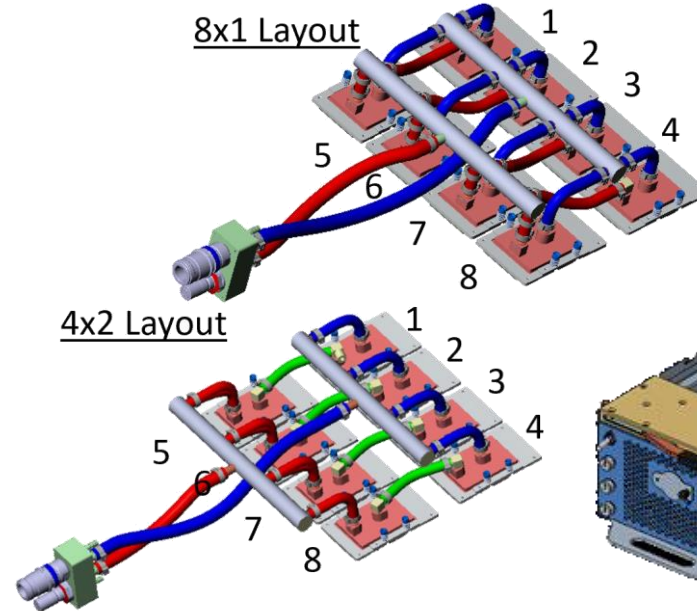
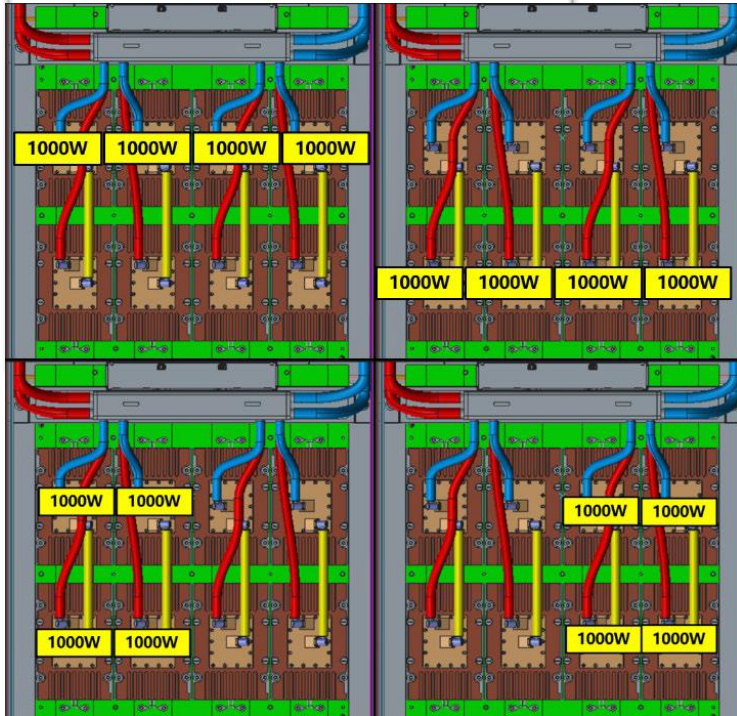


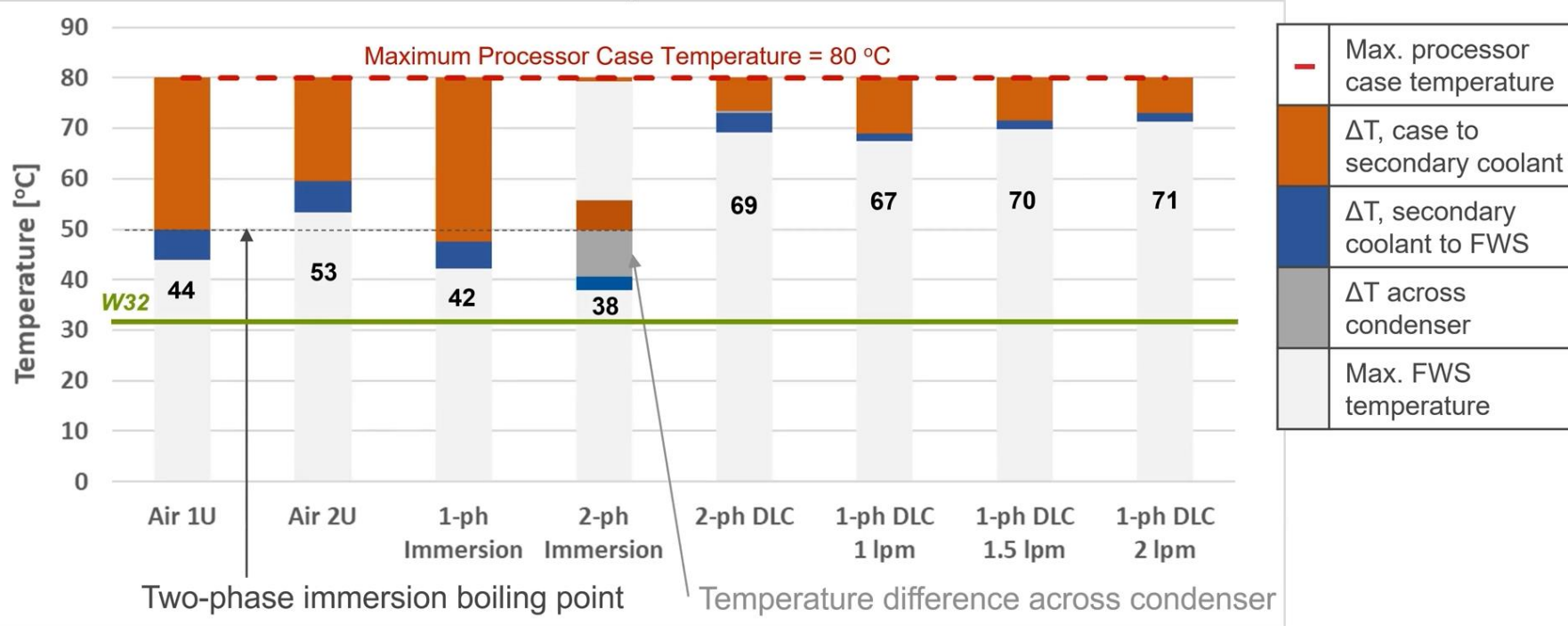
Figure 1. Prototype Chassis Design with TTV tray representing UBB1.0 and the 4x2 coldplate pairs of 5mm Manually-mate Quick Connects for coolant supply/return.

IT cooling will move from Air to direct liquid Cooling

Cooling water temperatures - 250 W processors



32 server rack of dual 250 W processors – 16 kW total rack load



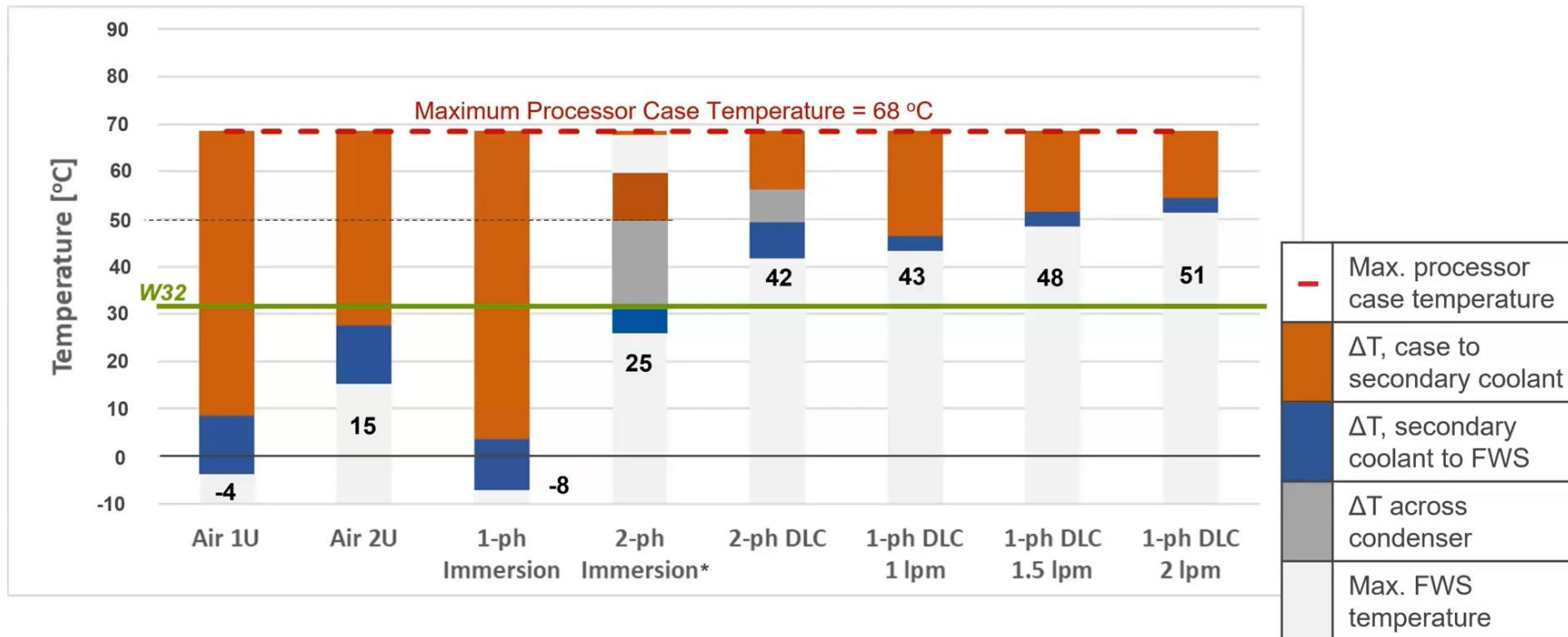
DELL Technologies

IT cooling will move from Air to direct liquid Cooling

Cooling water temperatures - 500 W processors



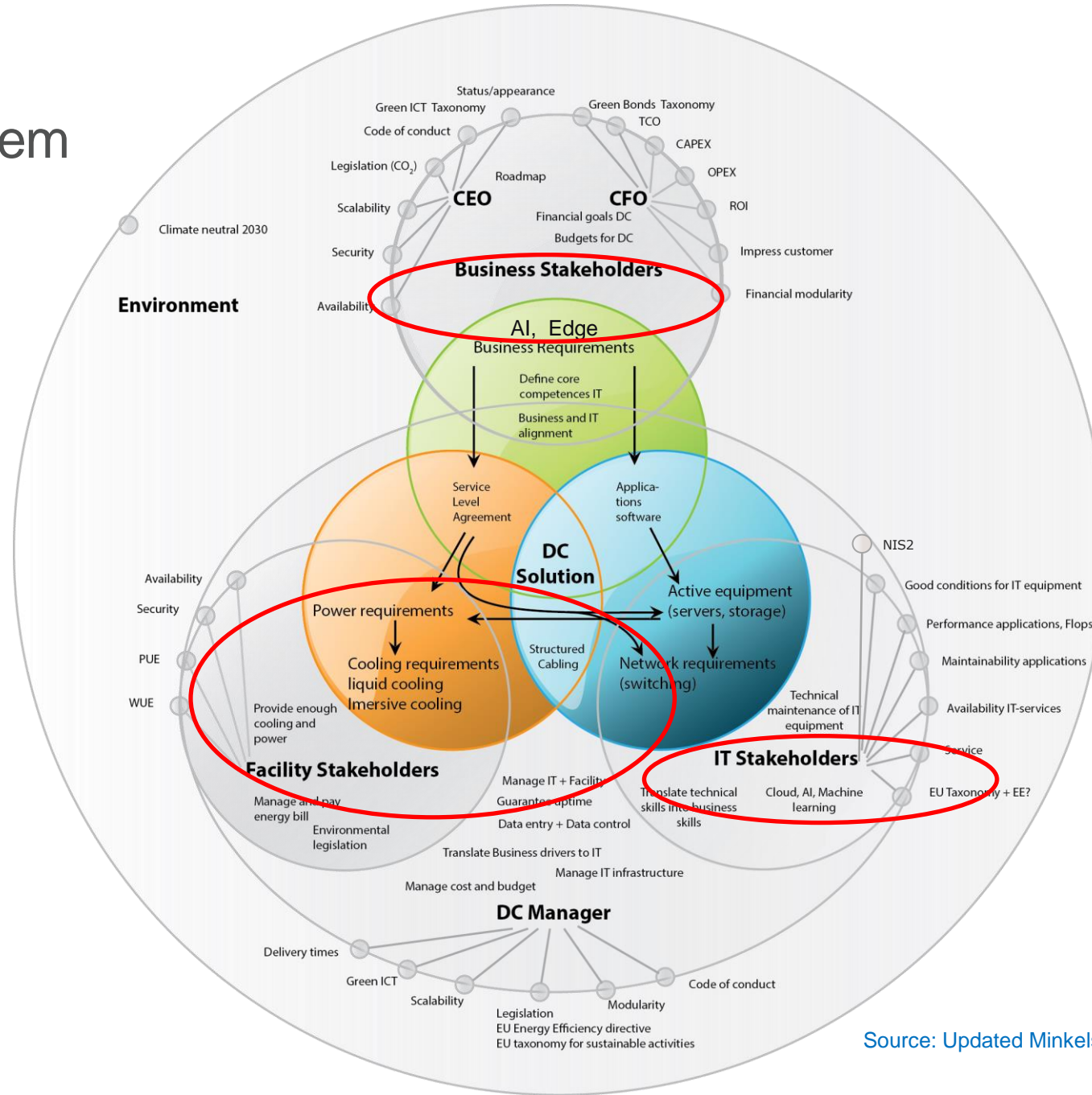
32 server rack of dual 500 W processors – 32 kW total rack load



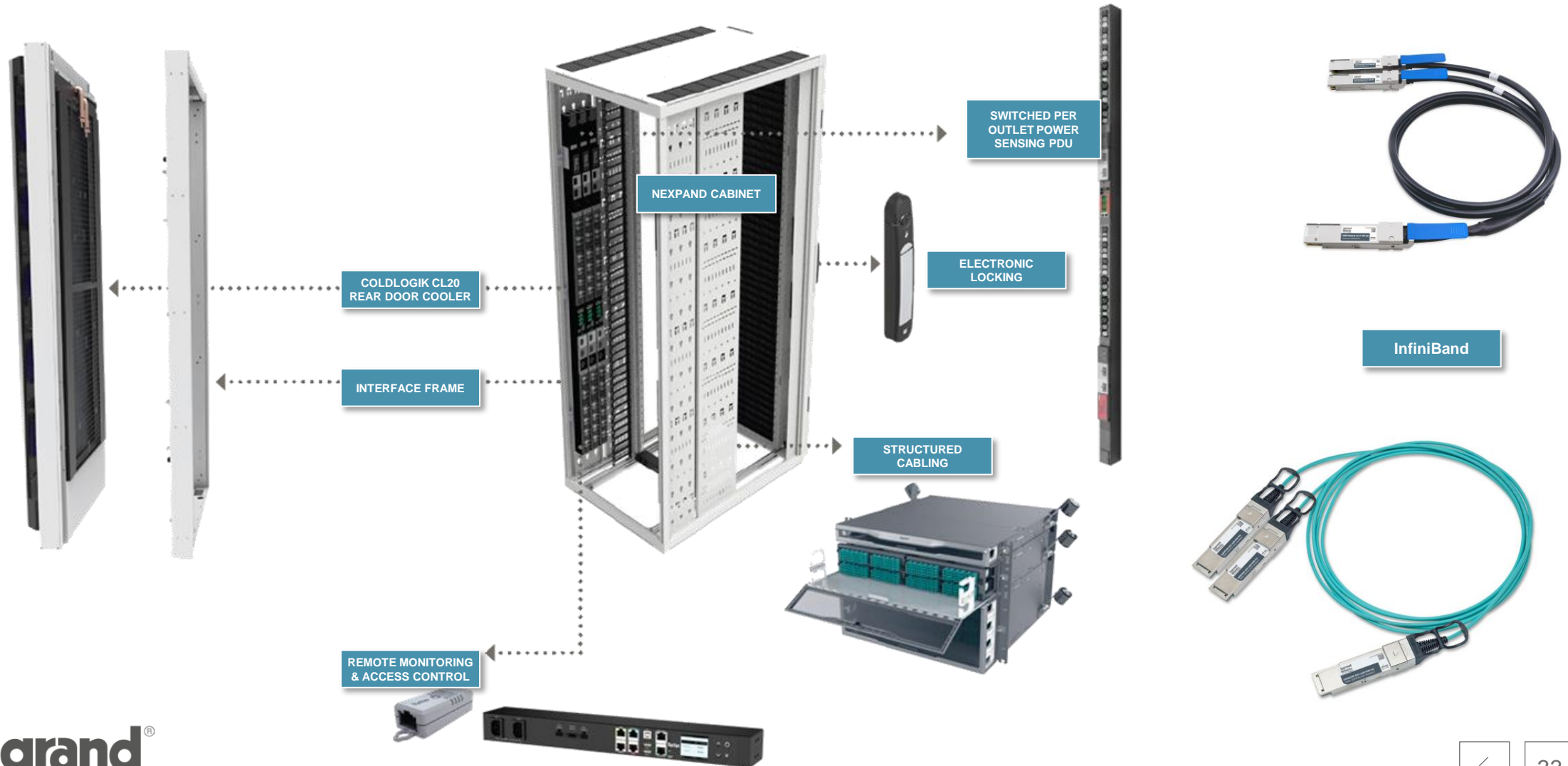
*Boiling point 50 °C

DELL Technologies

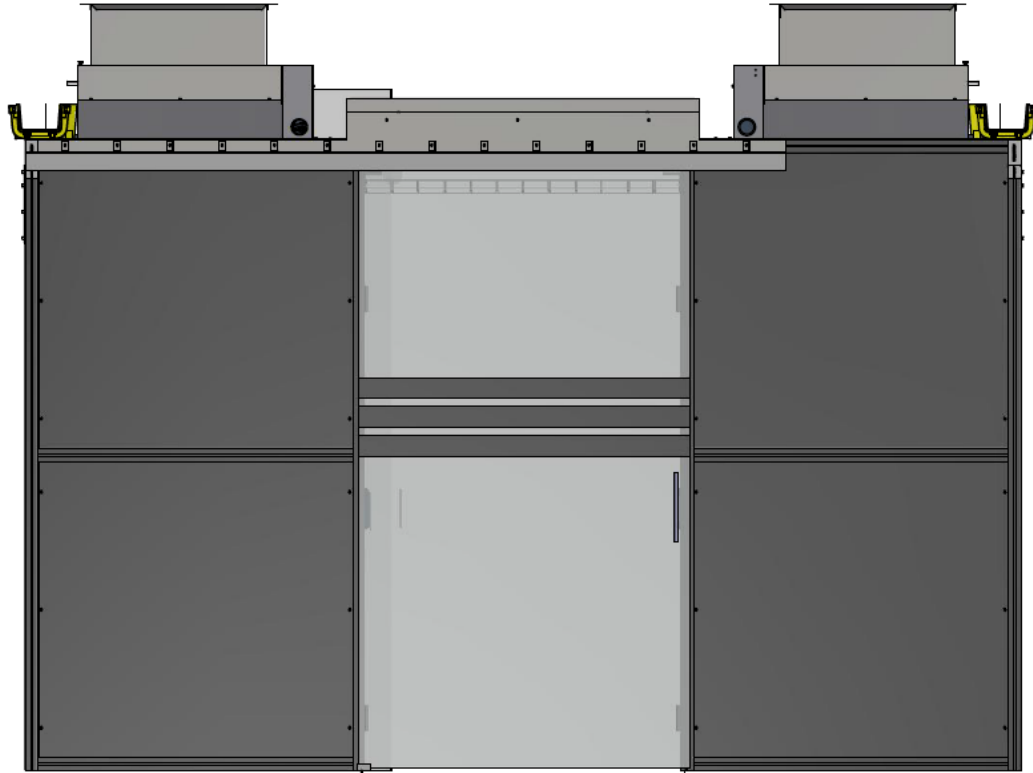
Data Centre ECO system



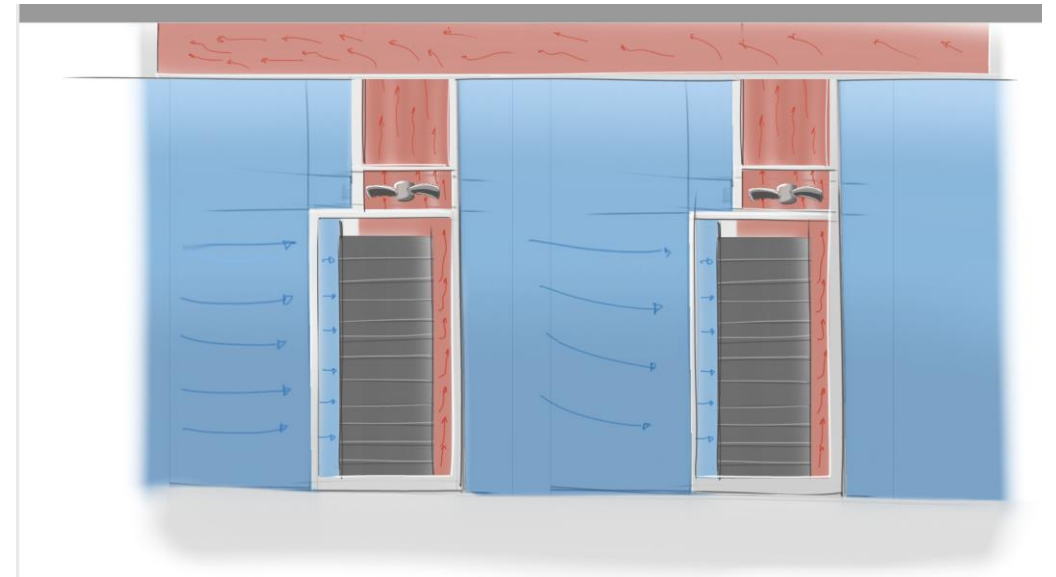
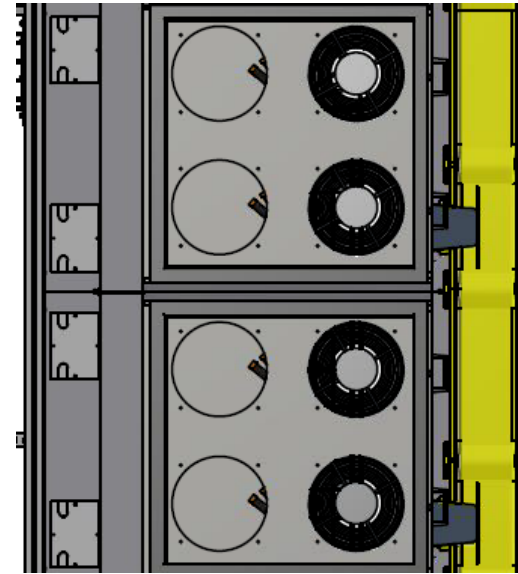
HIGH PERFORMANCE/AI COMPUTING LEGRAND DATA CENTER SOLUTIONS



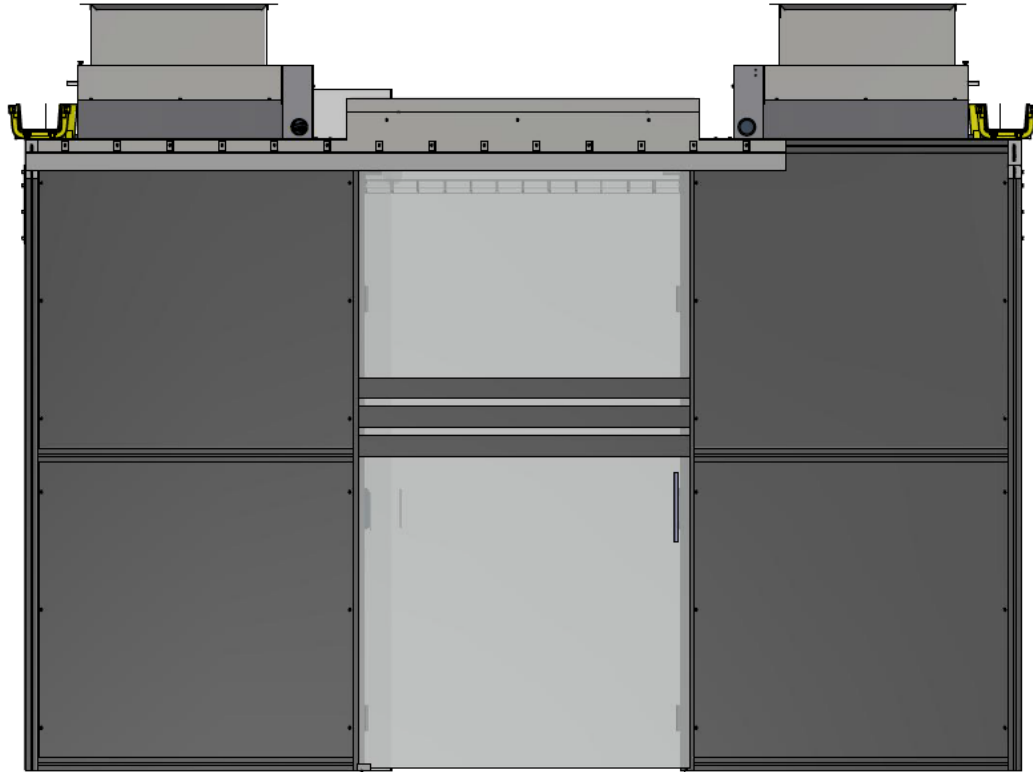
HIGH PERFORMANCE/AI COMPUTING LEGRAND DATA CENTER SOLUTIONS



HD cooling



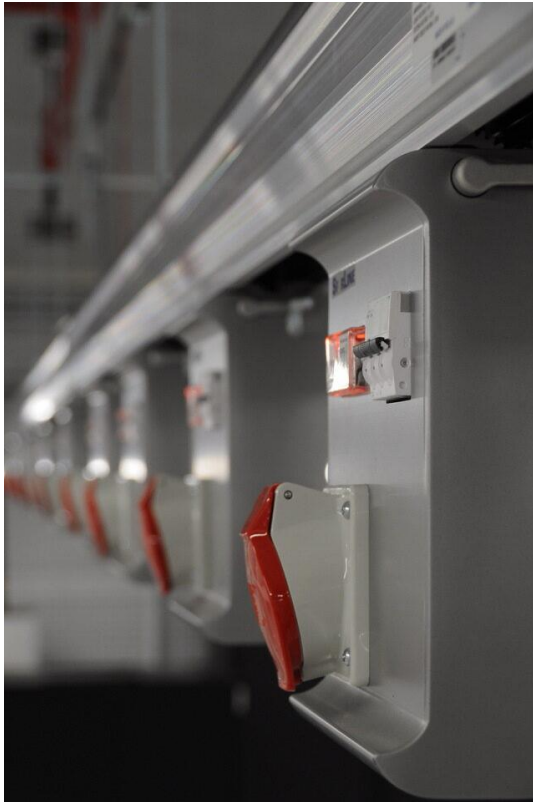
HIGH PERFORMANCE/AI COMPUTING LEGRAND DATA CENTER SOLUTIONS



HD cooling



HIGH PERFORMANCE/AI COMPUTING LEGRAND DATA CENTER SOLUTIONS



High power Starline Busbar

+

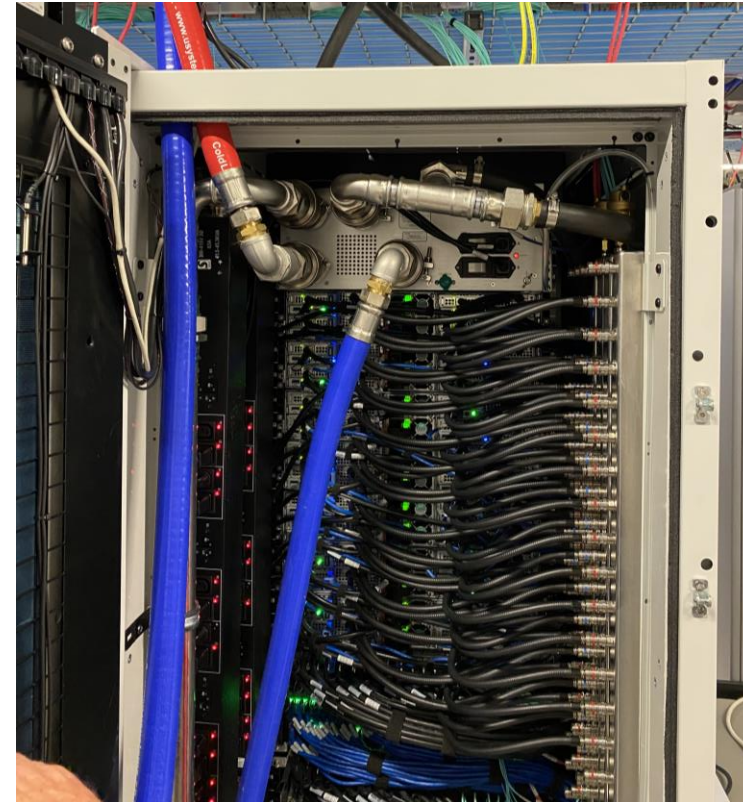
Rear door cooling

HIGH PERFORMANCE/AI COMPUTING LEGRAND DATA CENTER SOLUTIONS



Rear door cooling

+



Liquid chip cooling

Questions - Discussion



Reto Baumann
reto.baumann@minkels.ch



Helder Paulos
helder.paulos@minkels.ch

