



# ENABLING ARTIFICIAL INTELLIGENCE WITH ENGINEERED SUBSTRATES

December 2024

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The Company’s business operations and financial position are described in the Company’s Universal Registration Document (which notably includes the Annual Financial Report). The 2023-2024 Universal Registration Document will be filed with the French stock market authority (Autorité des Marchés Financiers, or AMF) on June 5, 2024. The French version of the 2023-2024 Universal Registration Document, together with English courtesy translation for information purposes, will be made available for consultation on the Company’s website ([www.soitec.com](http://www.soitec.com)), in the section Company - Investors - Financial Reports.

Your attention is drawn to the risk factors described in Chapter 2.1 (Risk factors and controls mechanism) of the Company’s Universal Registration Document.

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This document contains certain forward-looking statements. These forward-looking statements relate to the Company’s future prospects, developments and strategy and are based on analyses of earnings forecasts and estimates of amounts not yet determinable. By their nature, forward-looking statements are subject to a variety of risks and uncertainties as they relate to future events and are dependent on circumstances that may or may not materialize in the future. Forward- looking statements are not a guarantee of the Company’s future performance. The occurrence of any of the risks described in Chapter 2.1 (Risk factors and controls mechanism) of the Universal Registration Document may have an impact on these forward- looking statements. In particular, the future consequences of geopolitical conflicts, notably the Ukraine / Russia situation, as well as rising inflation, may result in greater impacts than currently anticipated in these forward- looking statements.

Any market shares presented herein are based on internal estimates and relate to that share of the market segment served and addressed by Soitec which may exclude broader segments of the market and competing technologies.

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# AGENDA

#01

ARTIFICIAL INTELLIGENCE  
FUNDAMENTALS

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#02

ARTIFICIAL INTELLIGENCE ADOPTION  
ACROSS SOITEC END MARKETS

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#03

SOITEC ENGINEERED SUBSTRATES TO ENABLE  
ARTIFICIAL INTELLIGENCE ADOPTION

# AI

# FUNDAMENTALS

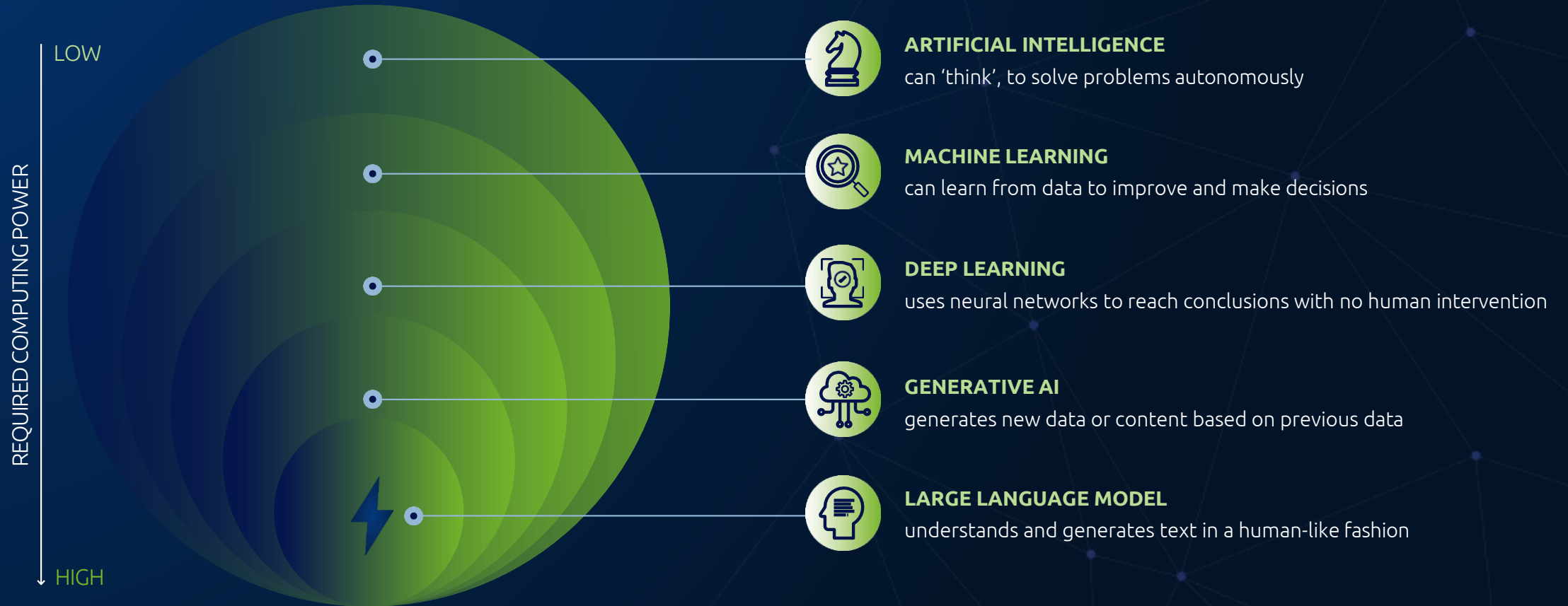


“Artificial intelligence is a machine’s ability to perform the cognitive functions we usually associate with human minds”

Source: McKinsey

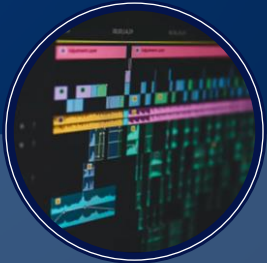


# WHAT IS ARTIFICIAL INTELLIGENCE?



Source: Accenture, SCS

# ARTIFICIAL INTELLIGENCE IS TRANSFORMING OUR DAILY LIVES



## Content Creation

Offering new tools for content creators



## Virtual Assistants

Augmenting productivity in everyday tasks



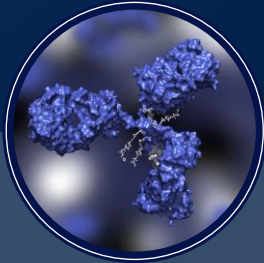
## Climate Research

Helping to combat climate change



## Smart Mobility

Driving Automotive Autonomy & Efficiency



## Healthcare & Lifesciences

Discovering new drugs & preventive treatments



## Wearables & Hearables

Delivering personal aid to overcome disabilities



## Security & Privacy

Enhancing threat detection & prevention

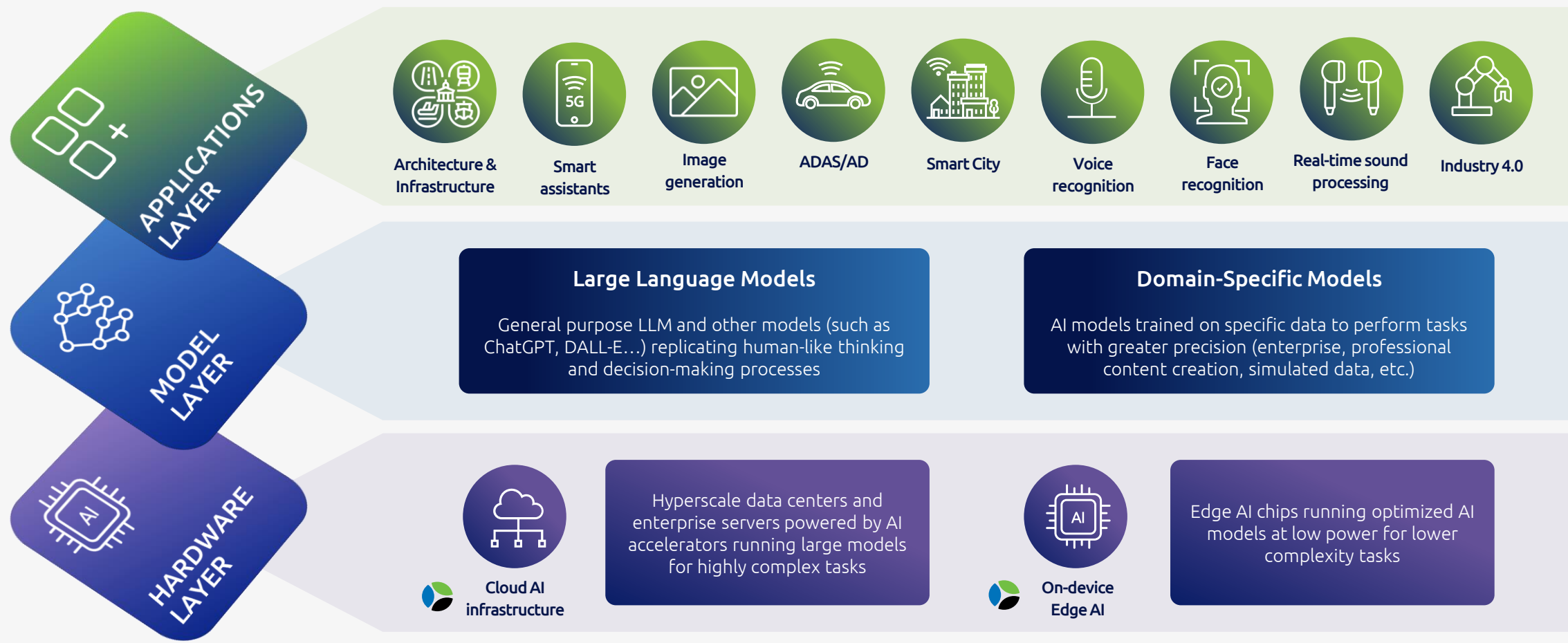


## Industry 4.0

Accelerating automation & efficiency roadmaps

# CHALLENGES FROM THE APPLICATIONS TO THE HARDWARE LAYERS

## SOITEC TECHNOLOGY TO LEVERAGE CLOUD AI & EDGE AI NEW CHALLENGES



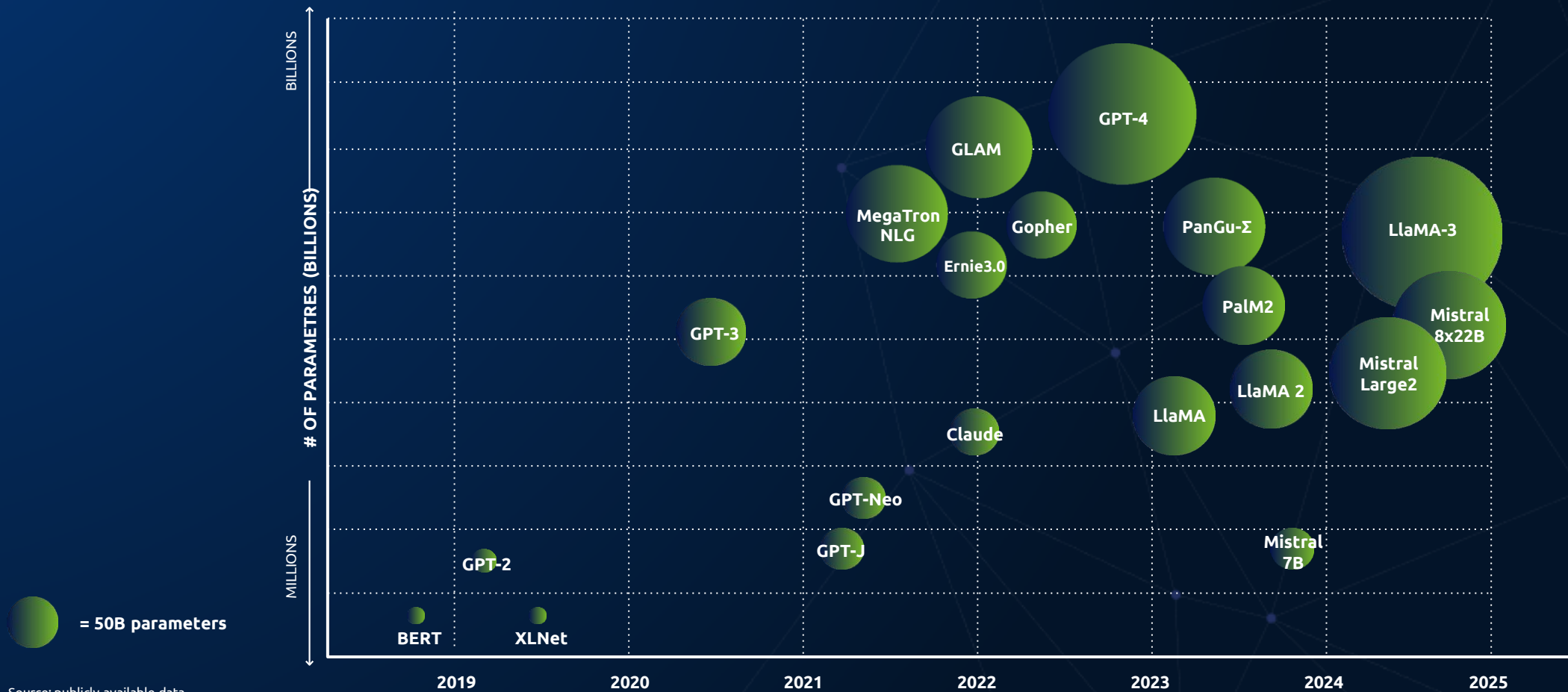
Source: Qualcomm, Red Hat





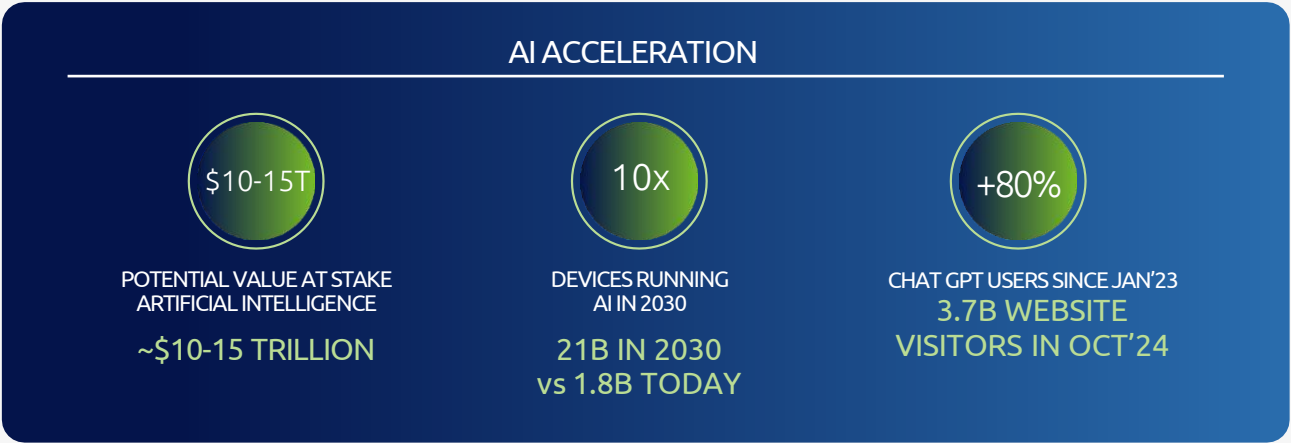
# LARGE LANGUAGE MODELS

EXPONENTIAL GROWTH OF LLM PARAMETERS ENABLES BREAKTHROUGH AI APPLICATIONS



# ARTIFICIAL INTELLIGENCE

## EXPONENTIAL GROWTH IN COMPUTING POWER



Healthcare diagnostic



Autonomous driving



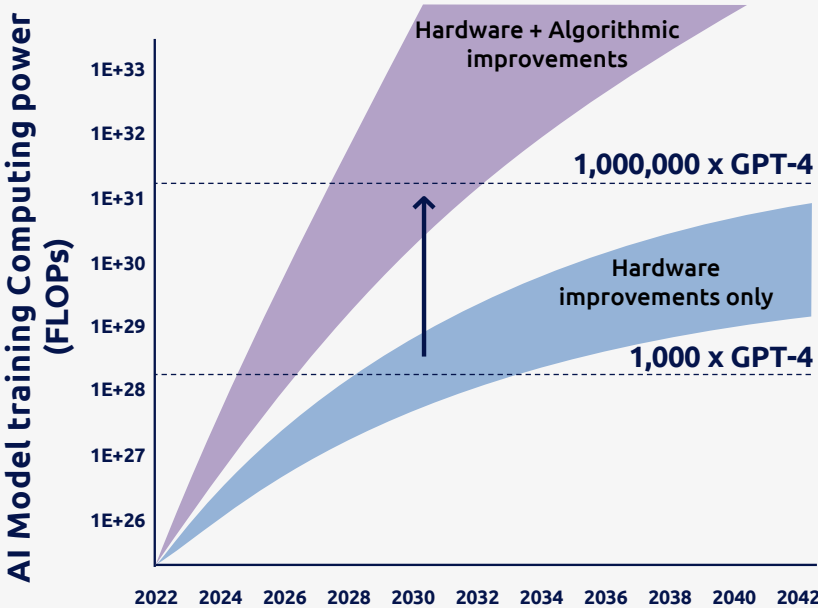
Industry 4.0



Digital creation

### Acceleration of Computing Power

GPT-4 estimated computing power

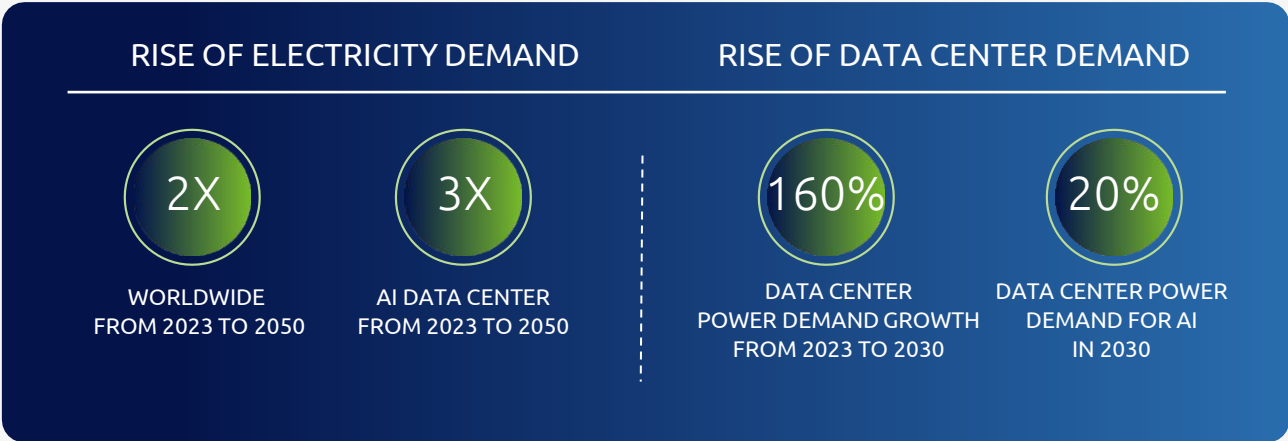


Source: McKinsey, Transforma Insights, OpenAI; Center for a New American Society, NamePepper



# ENERGY EFFICIENCY SOLUTIONS

## NECESSITY TO ADDRESS ENERGY CONSUMPTION IN AI INFRASTRUCTURE



Industrial applications



EV charging infrastructure

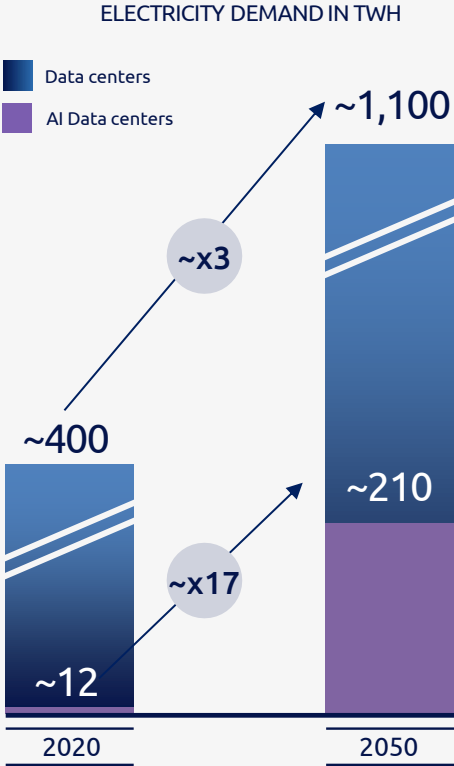


Smart Cities



Data centers

### Data center Power Demand

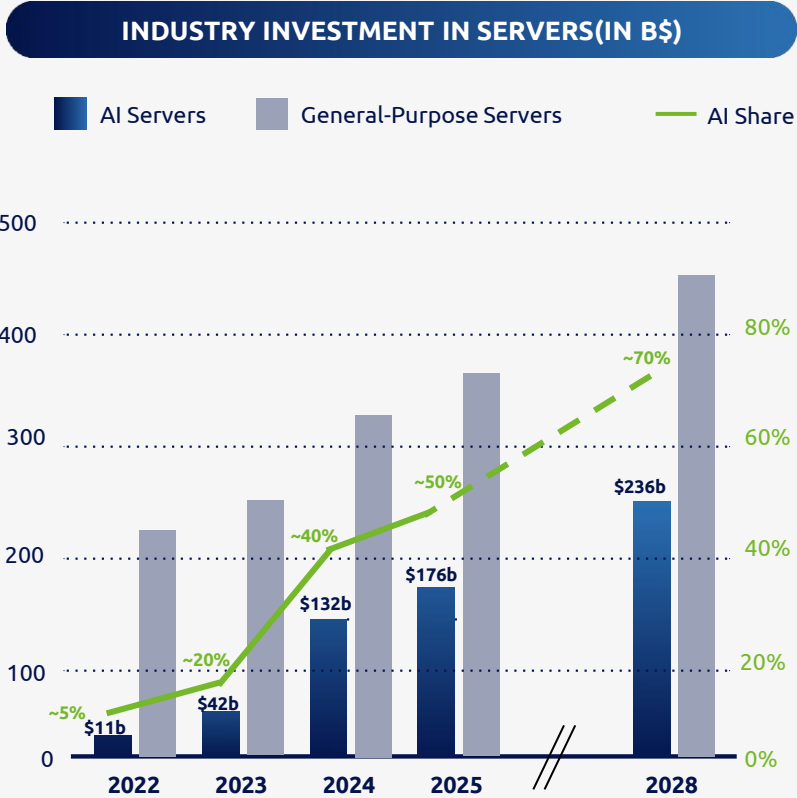
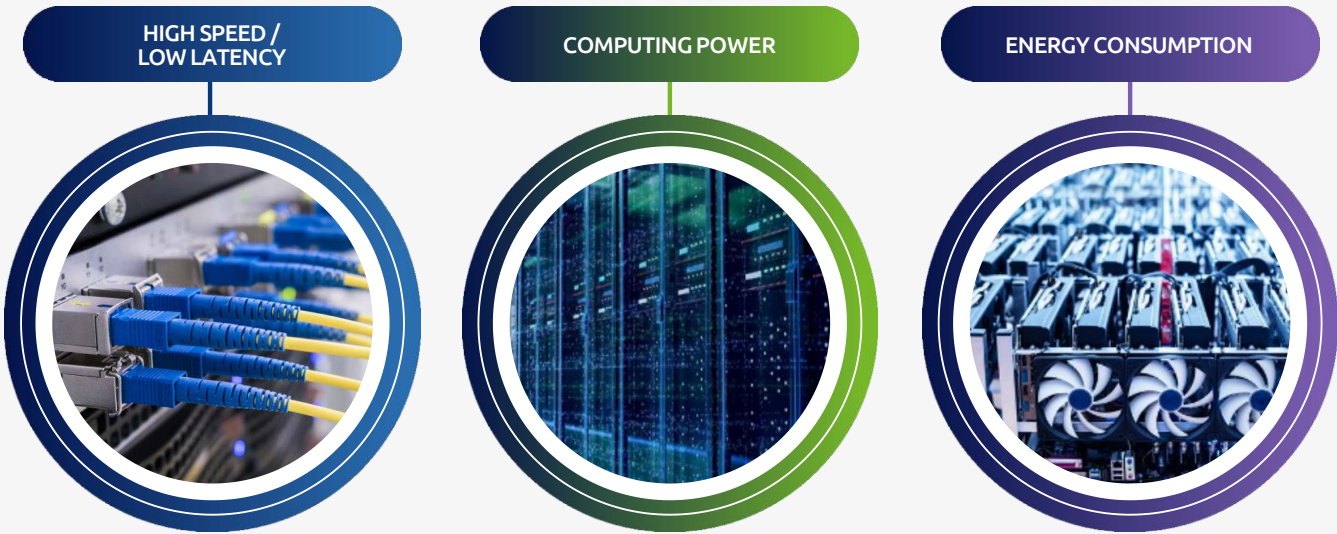


Source: IEA World Energy Outlook 2024; IDC '24, Goldman Sachs '24



# ARTIFICIAL INTELLIGENCE

## AI SERVER INVESTMENTS SET TO OVERTAKE GENERAL-PURPOSE SERVERS

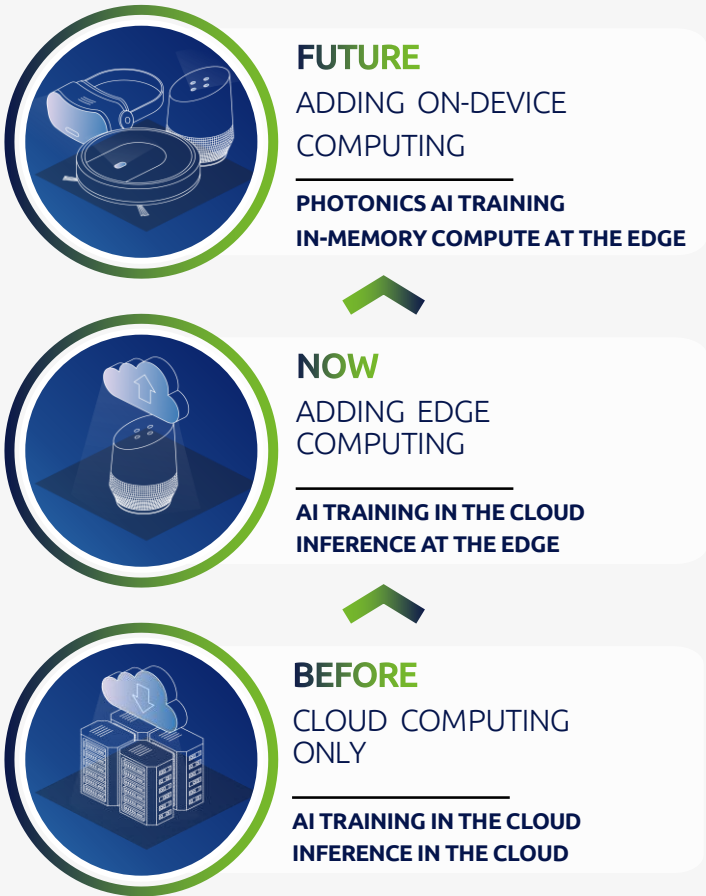


Source: The Next Platform, Oct 2024

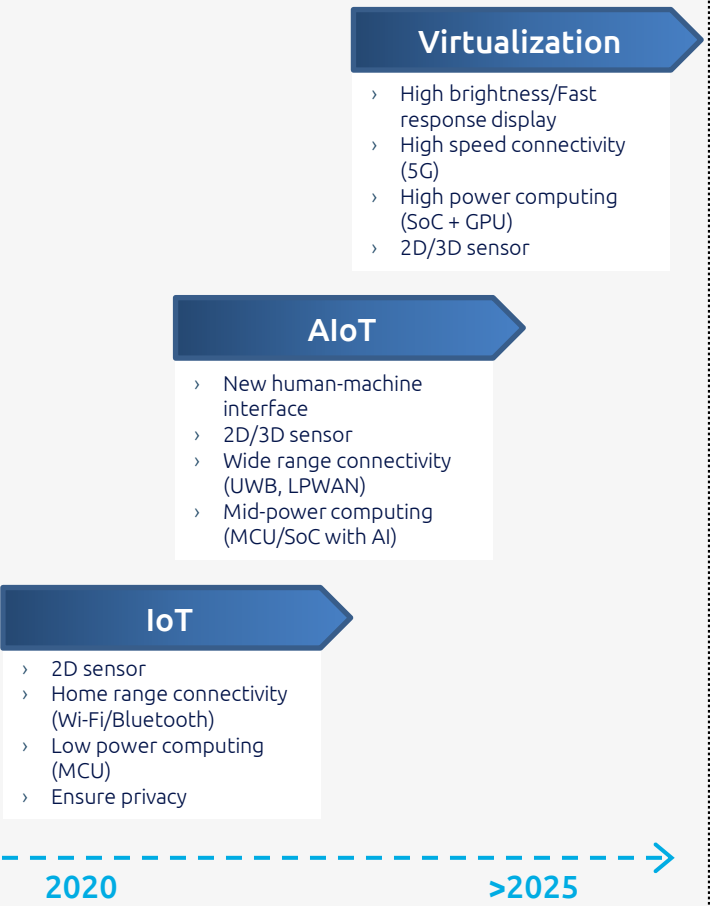


# ARTIFICIAL INTELLIGENCE

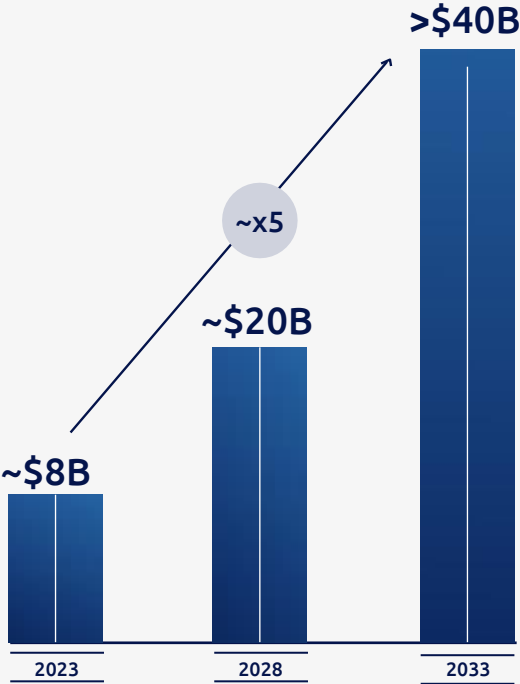
## WHY EDGE COMPUTING



### INTELLIGENCE AT THE EDGE



EDGE AI HARDWARE MARKET SET TO GROW x5 BY2033



Source: Market.US '24





# AI ADOPTION ACROSS SOITEC END MARKETS



# MOBILE COMMUNICATIONS

## EDGE AI SMARTPHONES

### CURRENT APPLICATIONS

- Computational photography
- Mobile gaming
- Voice assistant

### CLOUD AI LIMITATIONS

- Latency
- Need for a reliable connection
- Privacy risk
- High power consumption in datacenters



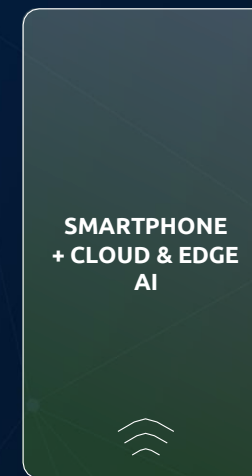
↑↓ 4G & 5G



STANDARD SMARTPHONE



↑↓ 5G &  
5G Advanced  
+ mmWave



### NEW AI APPLICATIONS



Advanced  
computational  
photography



Desktop-level  
gaming on  
smartphone



Augmented  
virtual  
companion



Real-time language  
translation



On-device text and  
image generation

### BENEFITS OF EDGE AI



Zero latency



No connection  
required



Privacy  
secured



Low power  
consumption

START OF AI FUNCTIONALITIES

Source: Qualcomm



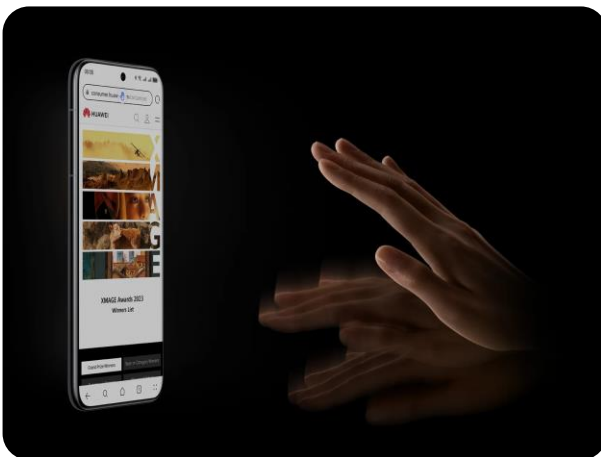
# THE EDGE AI SMARTPHONE REVOLUTION HAS ALREADY KICKED-IN NEXT KILLER APP COULD ACCELERATE SMARTPHONE REPLACEMENT CYCLE



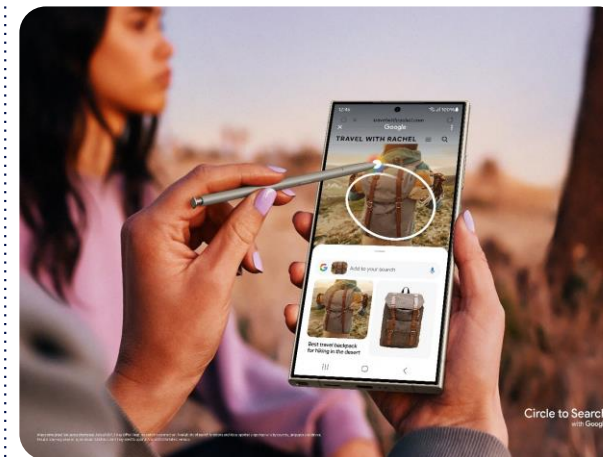
**Apple iPhone 16 & iPhone 16 Pro**  
built for Apple Intelligence,  
released in September 2024



**Google Pixel 9** with  
Gemini & AI Photo Editing,  
released in August 2024



**Huawei Pura 70 Series**  
with AI Gesture Control,  
released in April 2024



**Samsung Galaxy S24**  
Series with Galaxy AI,  
released in January 2024

Photo credit: apple.com, google.com, samsung.com, huawei.com



# AUTOMOTIVE & INDUSTRIAL AI TRANSFORMING THE AUTOMOTIVE BEYOND AUTONOMOUS DRIVING

## ADVANCED DRIVER ASSISTANCE & AUTONOMOUS DRIVING SYSTEMS (ADAS/AD)



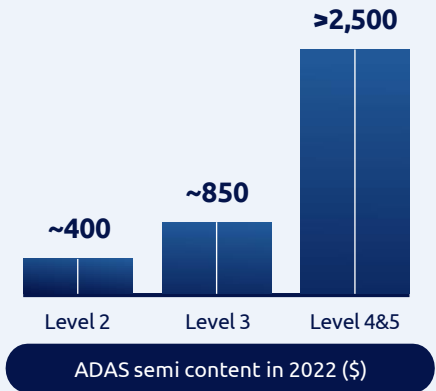
Advancing automation features from ADAS to AD and improving functional safety

### AI APPLICATIONS

- Object recognition
- Pedestrian detection
- Traffic sign detection
- Lane-crossing detection
- Speed limitation

### DATA COLLECTION, COMMUNICATION, COMPUTATION

- Front, Rear, Edge & imaging radars
- MCU / MPU
- LiDARs
- Zonal Edge computing
- Airbag / Braking system



## ENHANCED IN-VEHICLE EXPERIENCE



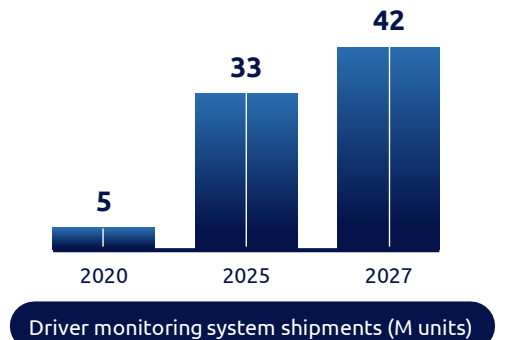
The car increasingly becoming a connected hub with in-cabin sensing and computing

### AI APPLICATIONS

- Eye-tracking
- Behavior monitoring
- Voice recognition
- Virtual assistance

### DATA COLLECTION, COMMUNICATION, COMPUTATION

- In-vehicle Sensors & Actuators
- Cameras
- Vehicle Networking
- Multimedia application processor
- Class D audio amplifier



Source: Yole, UBS



# AI DATA PROCESSING AT THE EDGE

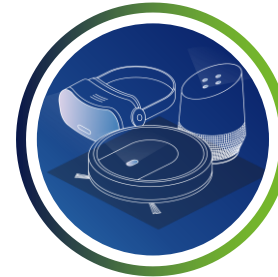
## FROM DATA ACQUISITION TO ON-DEVICE COMPUTING



### NOW

EDGE DATA ACQUISITION

AI TRAINING IN THE CLOUD  
INFERENCE AT THE EDGE



### FUTURE

ADDING ON-DEVICE COMPUTING

IN-MEMORY COMPUTE AT THE EDGE  
WITH HIGH EFFICIENCY INFERENCE

\$9B EDGE AI MARKET IN 2024<sup>(1)</sup>

BULKY INFORMATION TRANSFER

POWER CONSUMPTION

LATENCY

PRIVACY LIMITATIONS



\$43B EDGE AI MARKET IN 2033

EFFICIENT POWER CONSUMPTION

MINIMIZED DATA TRANSFER TO THE CLOUD

REDUCED LATENCY, REAL TIME PROCESSING

ENHANCED PRIVACY & SECURITY

Source: Market.US '24

1

2

AI ADOPTION

3

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# AI AT THE EDGE CREATES NEW CHALLENGES FOR DEVICES & SUBSTRATES

## MEMORY, SPEED, EFFICIENCY, POWER CONSUMPTION

### NEW TECHNICAL REQUIREMENTS

Inference at the edge  
High Density memory  
Power Autonomy  
Reliability and Robustness



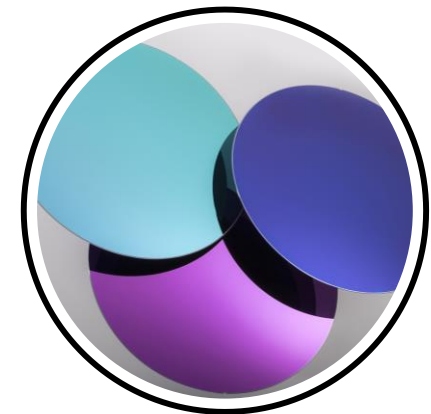
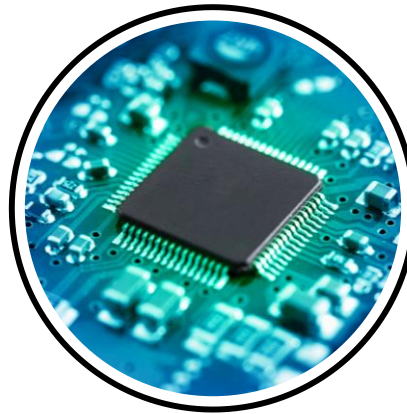
### MCU/MPU REQUIREMENTS AT DEVICE LEVEL

High speed hardware  
Optimized AI models & memory capabilities  
Ultra-low standby power and Boost mode  
Operation in adverse conditions



### ENGINEERED SUBSTRATES AS ENABLER

CMOS compatible  
Ultra-low leakage  
Interference immunity





# MCU IN REAL LIFE: TYPICAL CROSS OVER MCU FROM NXP SOITEC ENABLES EDGE AI WEARABLES

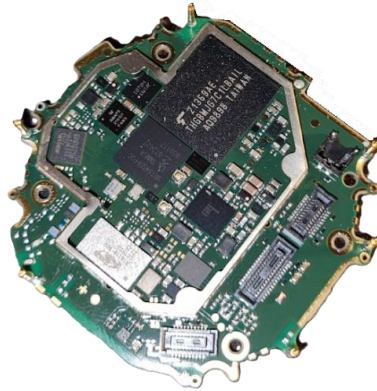
EDGE AI PRODUCT



Smartwatch



PCB BOARD



Edge board



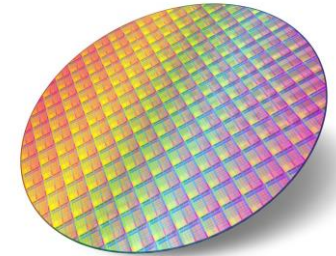
MICROCONTROLLER



Packaged MCU  
~50mm<sup>2</sup>



ENGINEERED SUBSTRATE



FD-SOI  
Die size >20mm<sup>2</sup>

Source: Garmin, NXP, Soitec estimate

1

2

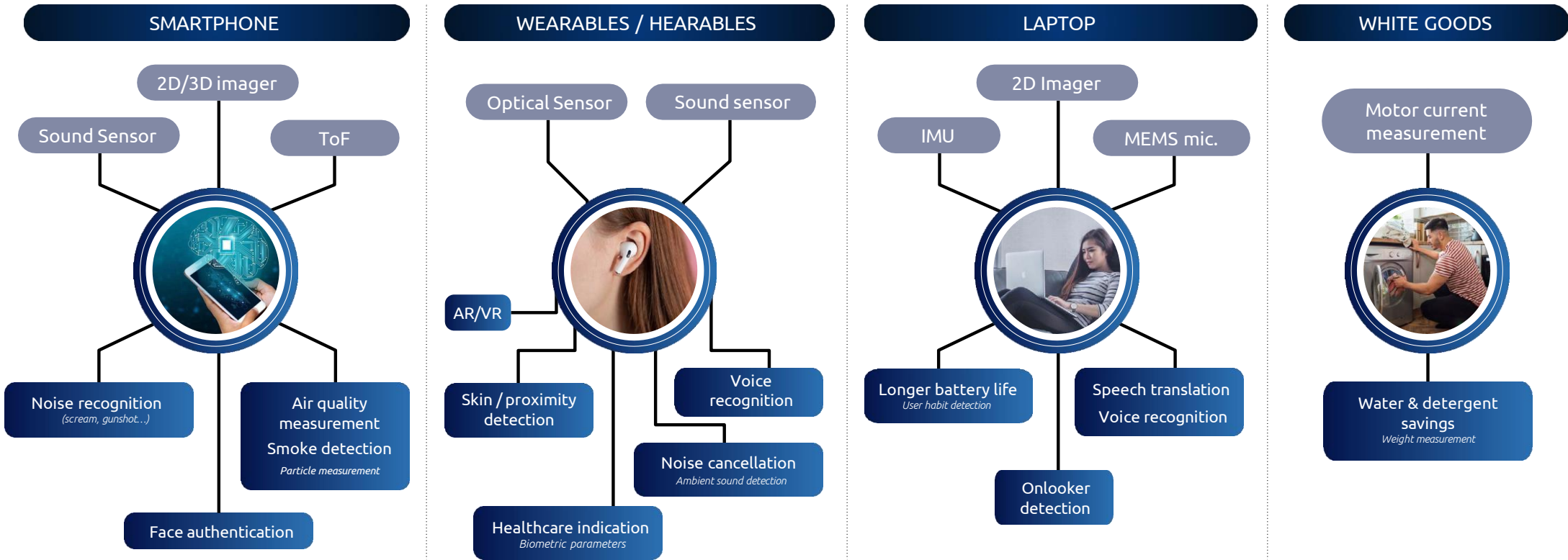
AI ADOPTION

3



## EDGE AI / IoT DEVICES

# FROM THE EDGE TO THE ENDPOINT, AI ENHANCING MULTIPLE USE CASES



### AI AT THE EDGE ENABLES

Lower latency

Power saving

Enhanced user experience

Greater privacy

Source: STMicroelectronics, Soitec internal data





# CLOUD AI IS DRIVING NEW CHALLENGES ACCELERATING THE ERA OF OPTICAL INTERCONNECTS

**HYPERGROWTH OF  
OPTICAL INTERCONNECTS**  
(Distance flexibility  
x Power Efficiency)

Reaching copper limitations

Accelerating demand for interconnects

Growing networking footprint

Increasing demand for xPUs

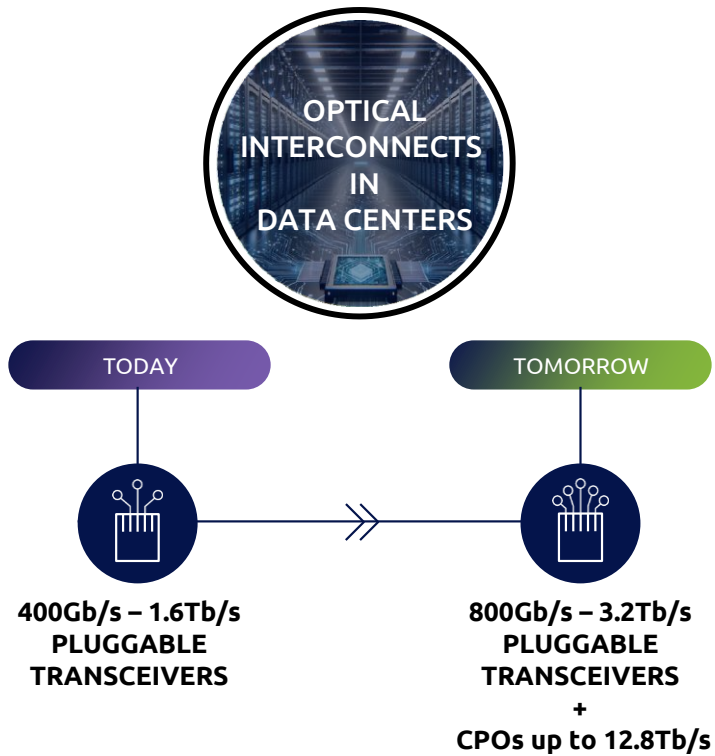
Scaling up & Scaling out AI Infrastructure

**GROWTH IN LLM SIZE AND COMPLEXITY**  
(Inference & training)

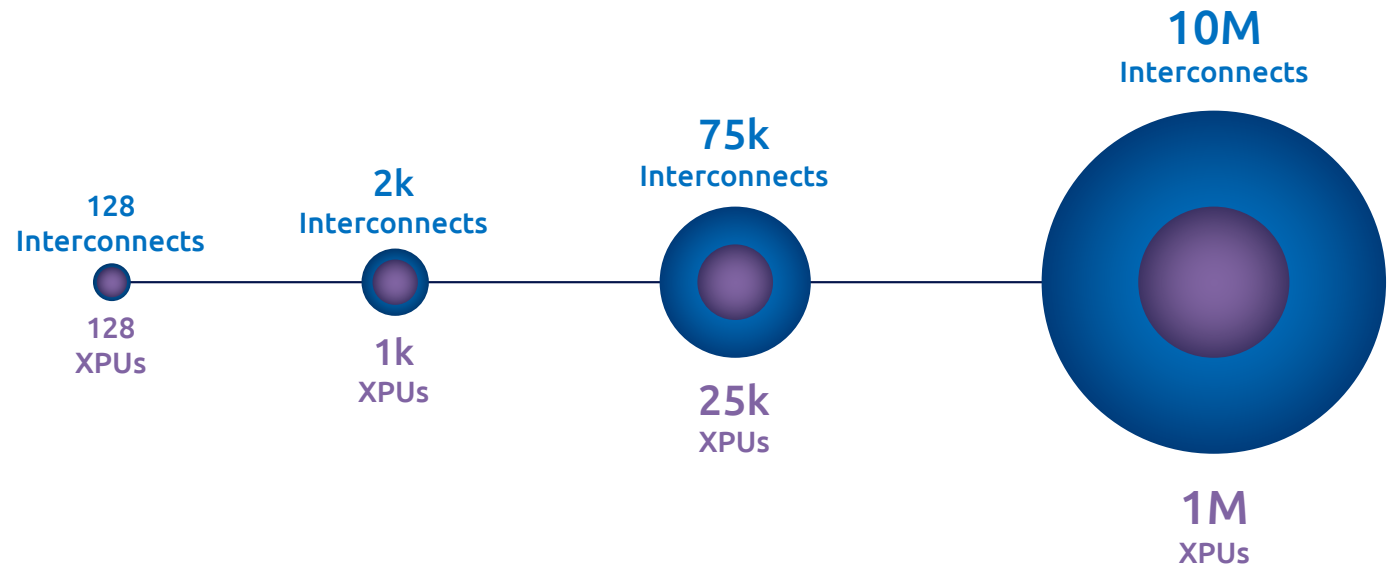


## OPTICAL INTERCONNECTS

# INCREASING HIGH BANDWIDTH CONNECTIVITY IN DATA CENTERS DRIVING HIGHER SEMICONDUCTOR CONTENT GROWTH



### OPTICAL INTERCONNECTS GROWING FASTER THAN XPUs



Source: Marvell, Investor presentation, 2024





# SILICON PHOTONICS IS THE PLATFORM OF CHOICE FOR OPTICAL INTERCONNECTS

## SOI IS THE FOUNDATION OF SILICON PHOTONICS

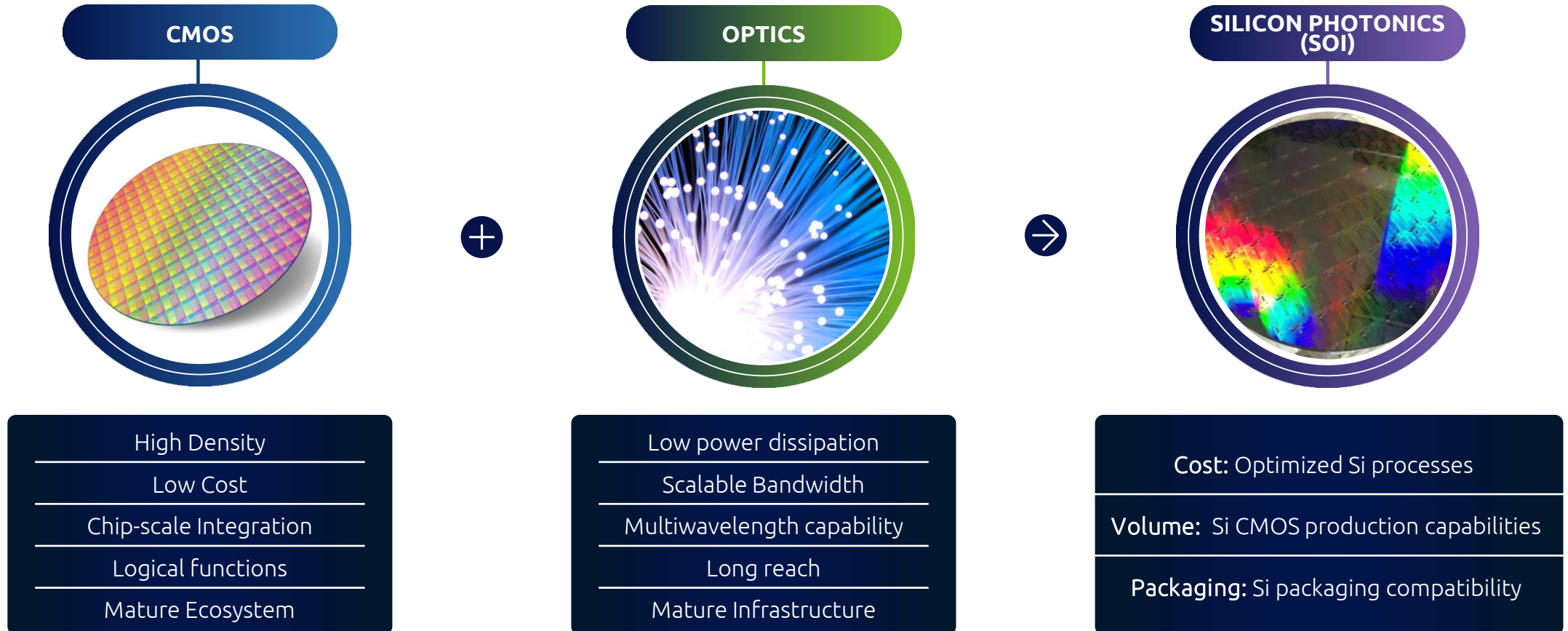


Photo credit: Ehsanshahoseini, CC BY-SA 4.0



## WHERE IS SILICON PHOTONICS?

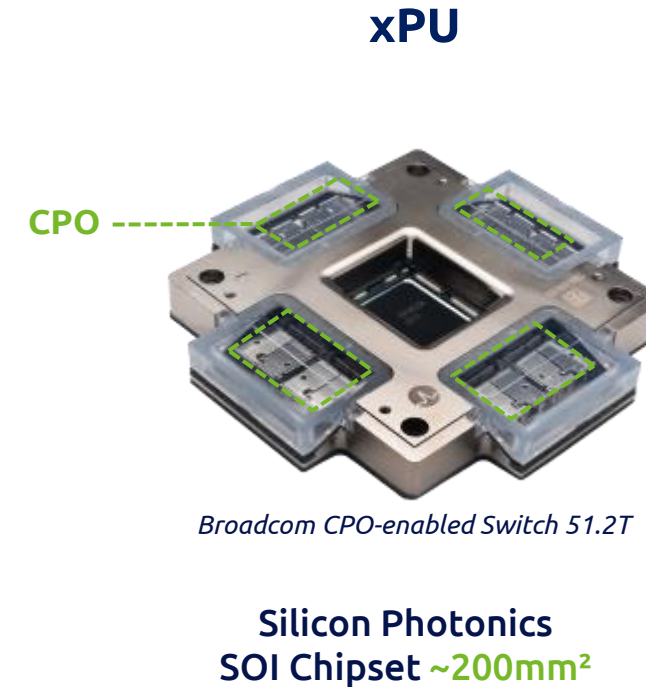
# CLOUD AI & DATACENTER INFRASTRUCTURE AS KEY DRIVERS

### PLUGGABLE TRANSCEIVERS



Source: Broadcom

### CO-PACKAGED OPTICS (CPO)





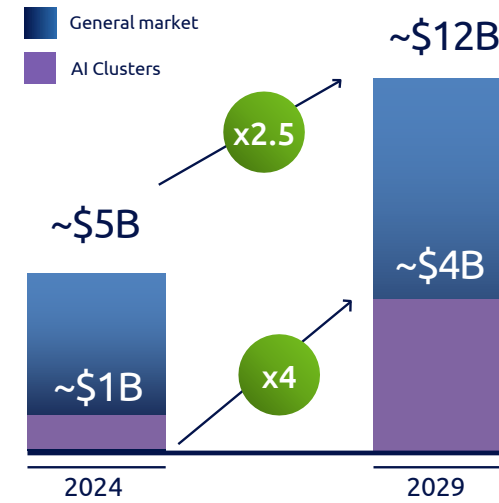
# SILICON PHOTONICS TO BE CLOSER AND CLOSER TO THE CHIP

## SILICON PHOTONICS DEPLOYMENT THROUGH PLUGGABLE OPTICS & CPO

### CURRENT AI / ML INFRASTRUCTURE IS BANDWIDTH x DISTANCE LIMITED

	TODAY	WITHIN DECADE
Data Center Interconnect (DCI)	OPTICAL	
Rack-to-Rack	OPTICAL	
Board-to-Board		OPTICAL
Chip-to-Module	ELECTRICAL	OPTICAL
Chip-to-Chip		
AI / ML		

### SILICON PHOTONICS OPTICAL TRANSCEIVER MARKET (DEVICE \$B REVENUE)



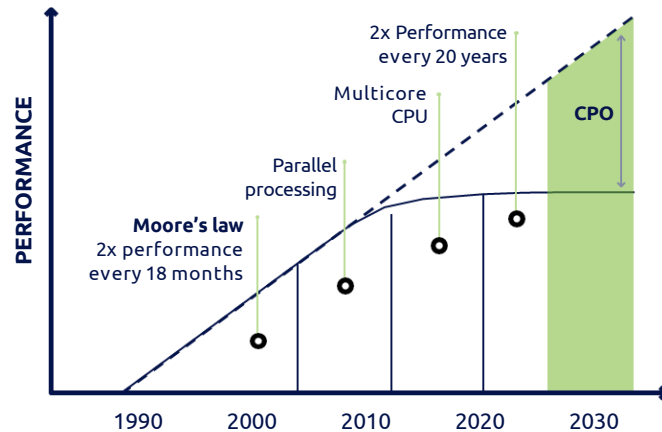
Source: LightCounting, 2024



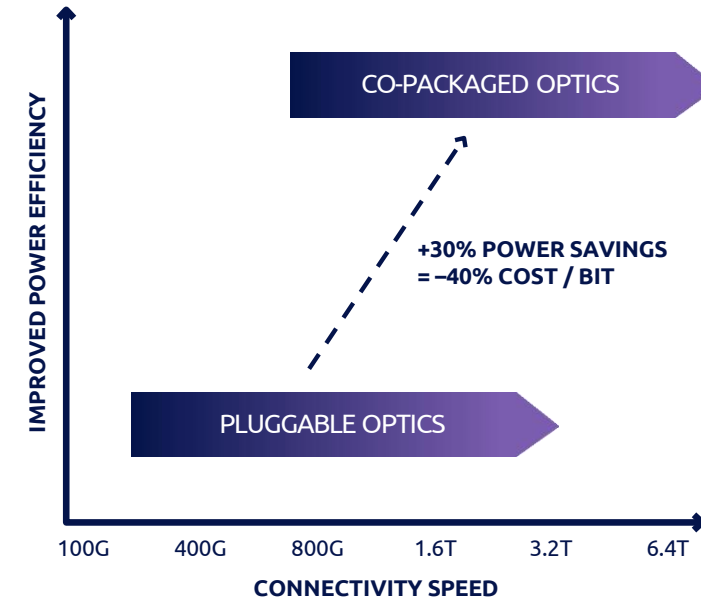
# EDGE AND CLOUD AI

## ONGOING TRANSITION TO CO-PACKAGED OPTICS

### CO-PACKAGED OPTICS (CPO) A MEANS TO EMULATE MOORE'S LAW



### FUTURE AI / ML INFRASTRUCTURE A MULTI-LAYERED NETWORK

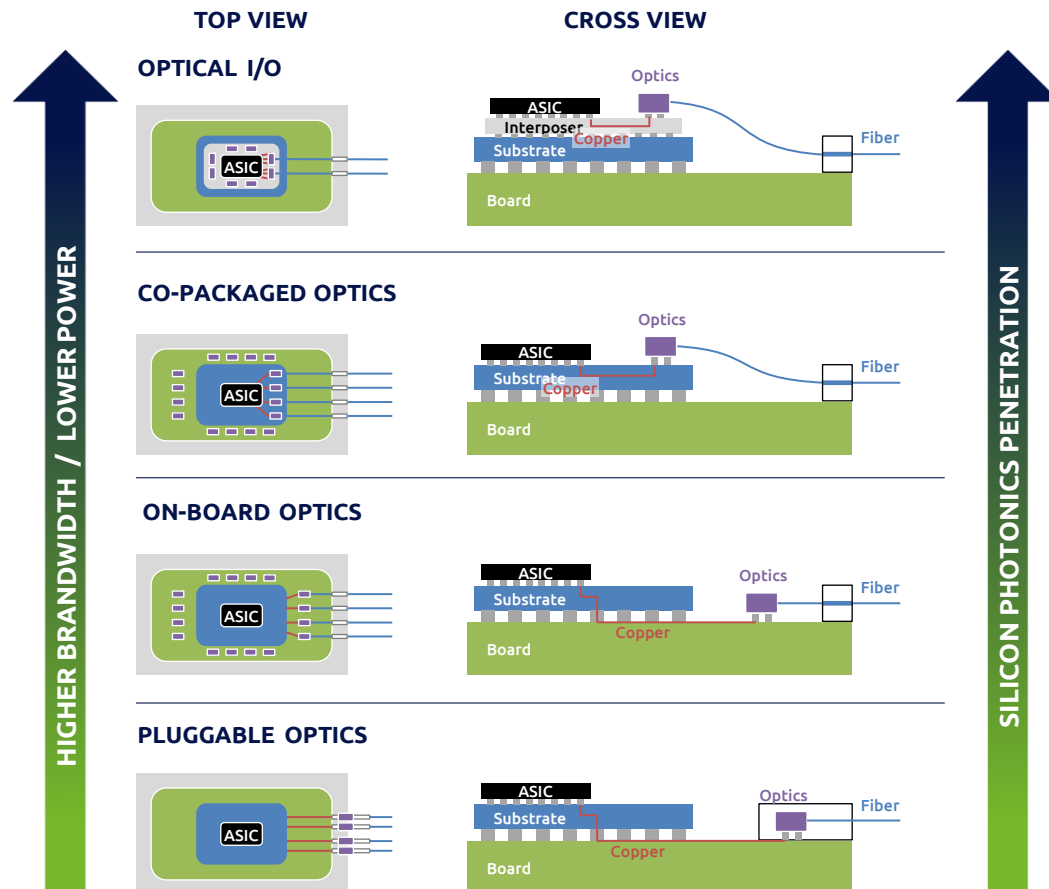


Source: Broadcom, Yole, Researchandmarkets



# OPTICAL I/O FOR GPU INTERCONNECTS

## LOWER LATENCY AND 30% REDUCTION IN ENERGY CONSUMPTION



### EMPOWERING AI ACCELERATION WITH OPTICAL I/O GPU INTERCONNECTS



#### ENHANCED BANDWIDTH

Enable improved bandwidth capabilities, for rapid and efficient data transfer between CPUs and GPUs in AI workloads



#### IMPROVED ENERGY CONSUMPTION

Enhance faster data transfer with lower power consumption, allowing for more computational work with reduced energy usage



#### REAL-TIME PROCESSING

Ensuring swift communication between the CPU and GPU, crucial for real-time AI processing



#### SCALABILITY

Allowing systems to easily accommodate increased computational demands in AI



#### OPTIMIZED PARALLELISM

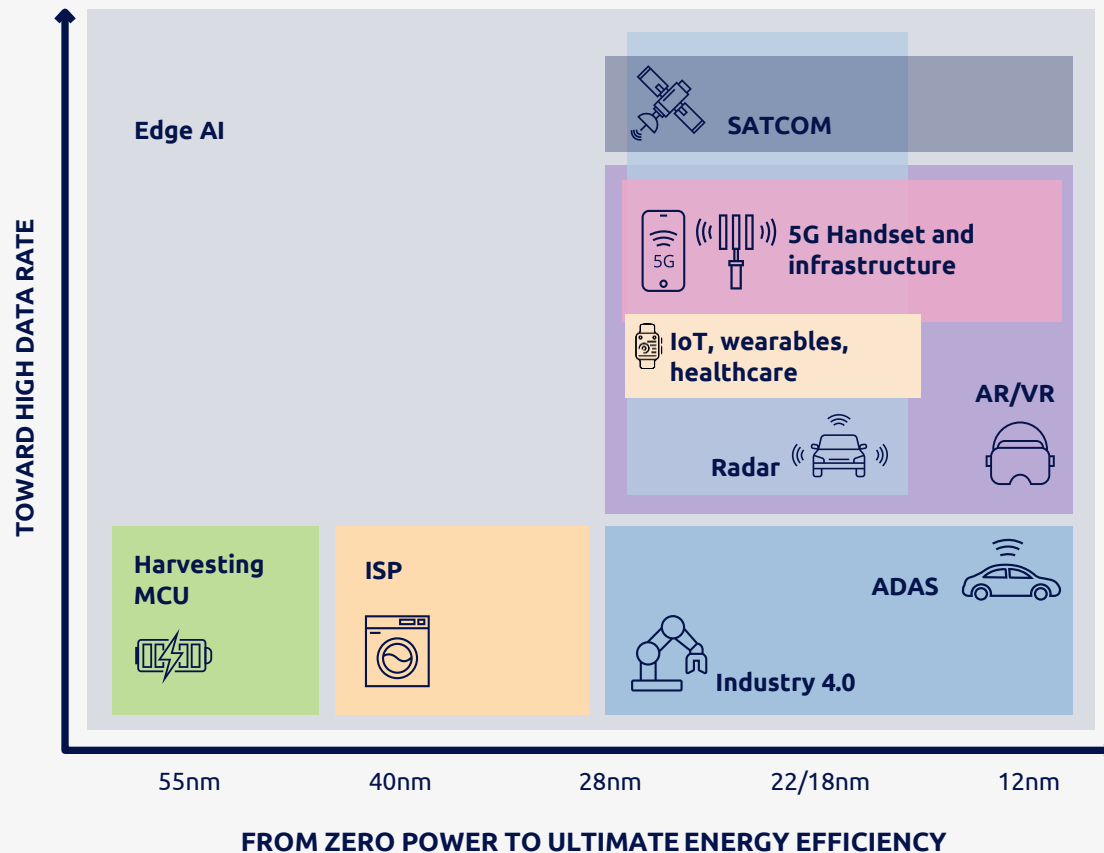
Essential in scenarios where multiple AI models or different types of computations run concurrently



# ENGINEERED SUBSTRATES TO ENABLE AI ADOPTION

# FD-SOI

## MARKET SEGMENTATION



### FD-SOI IS THE ANSWER FOR APPLICATIONS REQUIRING

- Performance-on-demand
- Battery-powered
- Integrated RF
- Embedded NVM memories

### 3 MARKET DRIVERS

- AI MCUs
- 5G
- Automotive

**FD-SOI Edge AI inference hardware will support all those segments**



# AUTOMOTIVE & INDUSTRIAL PRODUCT PORTFOLIO

## AUTO FD-SOI



AUTO FD-SOI EMPOWERS THE FUTURE OF AUTOMOTIVE AND INDUSTRIAL SMART DEVICES



ADAS



Radars



Industrial Automation

AUTO FD-SOI ENABLES SUPERIOR PERFORMANCE OVER BULK SILICON AND FINFET

SAVING POWER

~30%

GREENHOUSE GASES  
EMISSION REDUCTION

SAVING LIVES

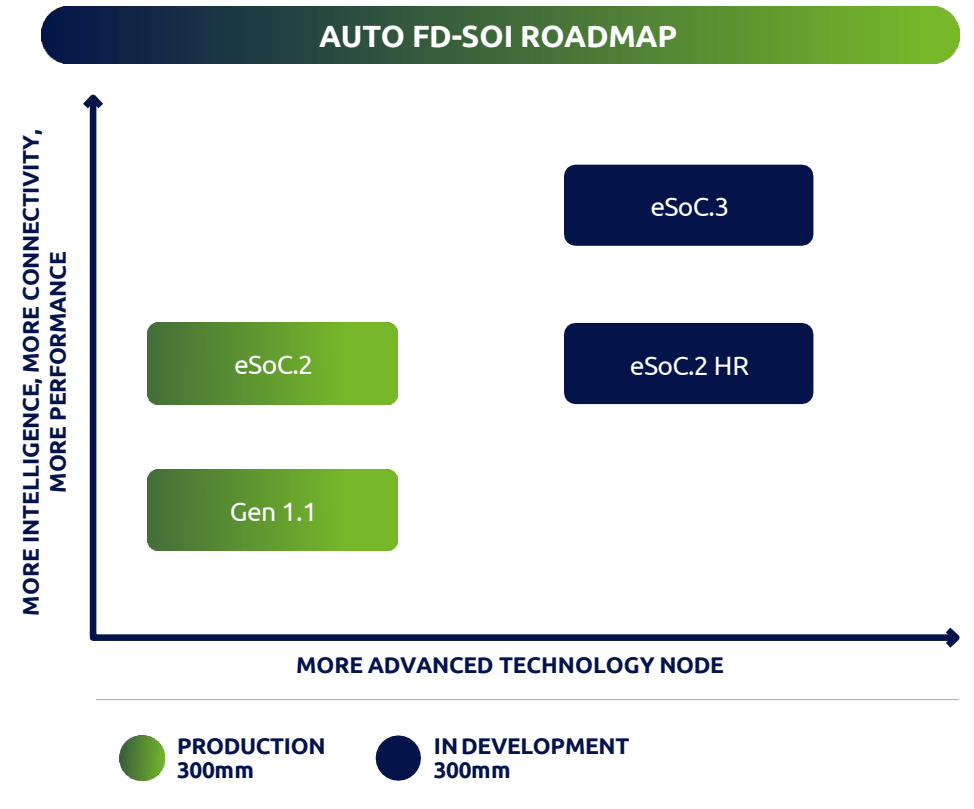
~50%

HIGHER DETECTION  
RANGE IN RADARS

SAVING COST

~50%

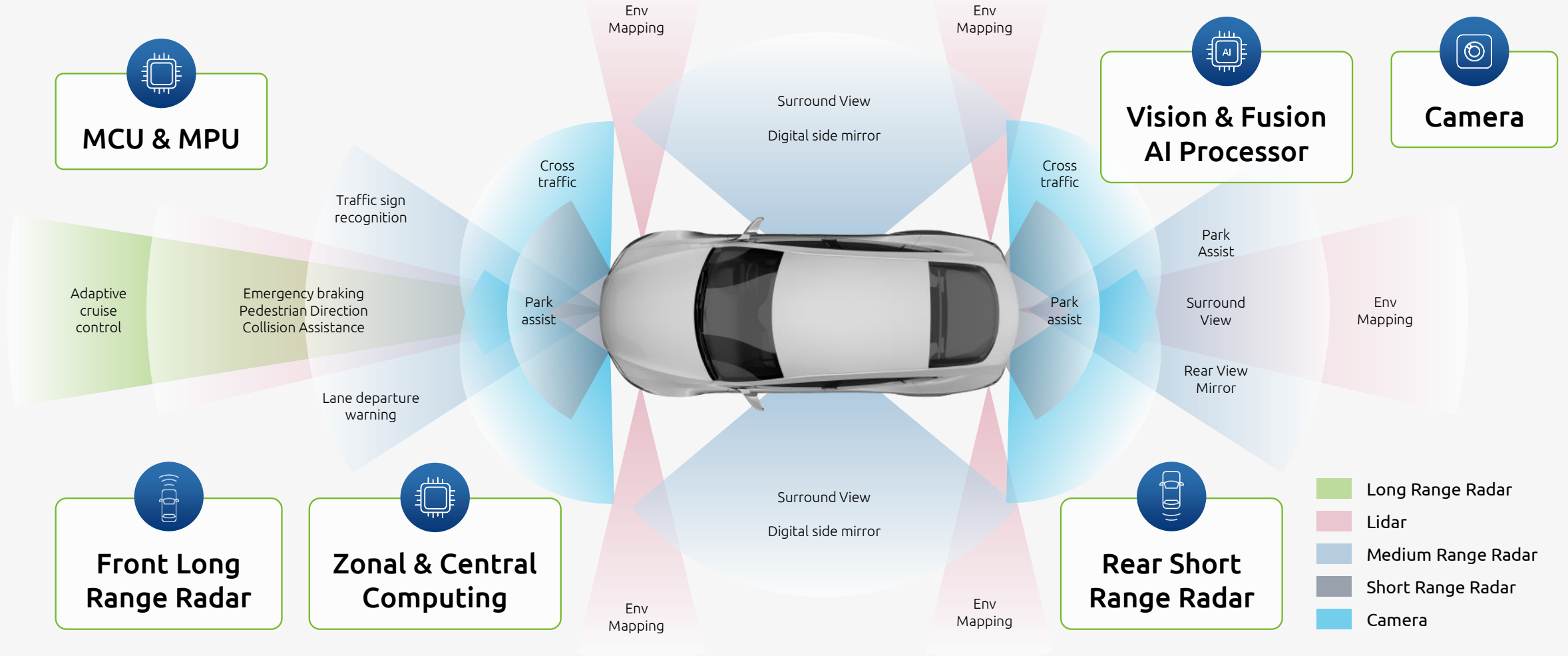
DIE SIZE  
REDUCTION





## AUTO FD-SOI FIELDS OF USE

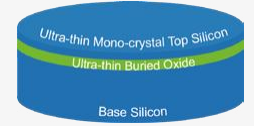
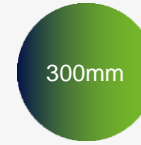
# ACCELERATING VEHICLE AUTONOMY, DIGITISATION AND CONNECTIVITY





# EDGE & CLOUD AI PRODUCT PORTFOLIO

## FD-SOI: INDUSTRY WIDE ADOPTION DOWN TO 18nm



### FD-SOI BENEFITS ALL WEARABLE APPLICATIONS WITH BETTER PERFORMANCES



Smart Home Devices



Wearables



Environmental  
Smart Sensors



Medical IoT

### OUR FD-SOI SUBSTRATE ENABLES



LOWER ACTIVE  
POWER  
CONSUMPTION -  
ALWAYS ON



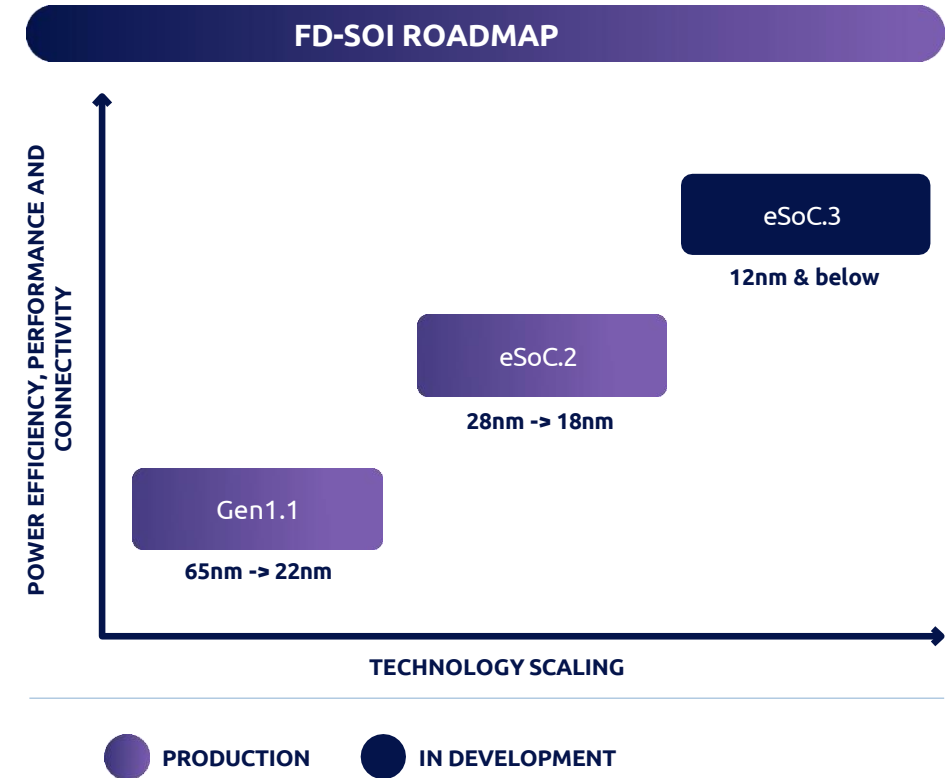
PERFORMANCE  
ON DEMAND



ROBUST ENERGY  
HARVESTING  
'ZERO POWER'  
CAPABILITIES



LOWEST-COST  
PROCESSING  
(INFERENCES-PER-  
WATT-PER-\$)

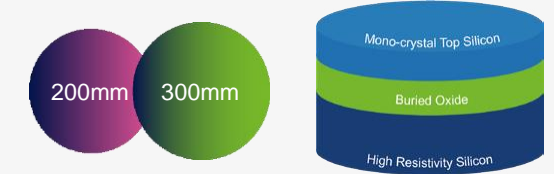




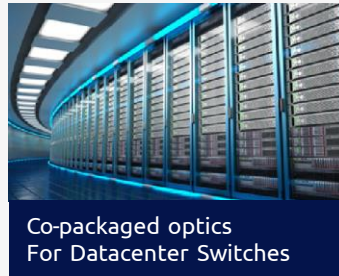


# EDGE & CLOUD AI PRODUCT PORTFOLIO

## PHOTONICS-SOI



### PHOTONICS-SOI IS TARGETING ENERGY-EFFICIENT FAST DATA TRANSFER



### OUR PHOTONICS-SOI SUBSTRATE ENABLES



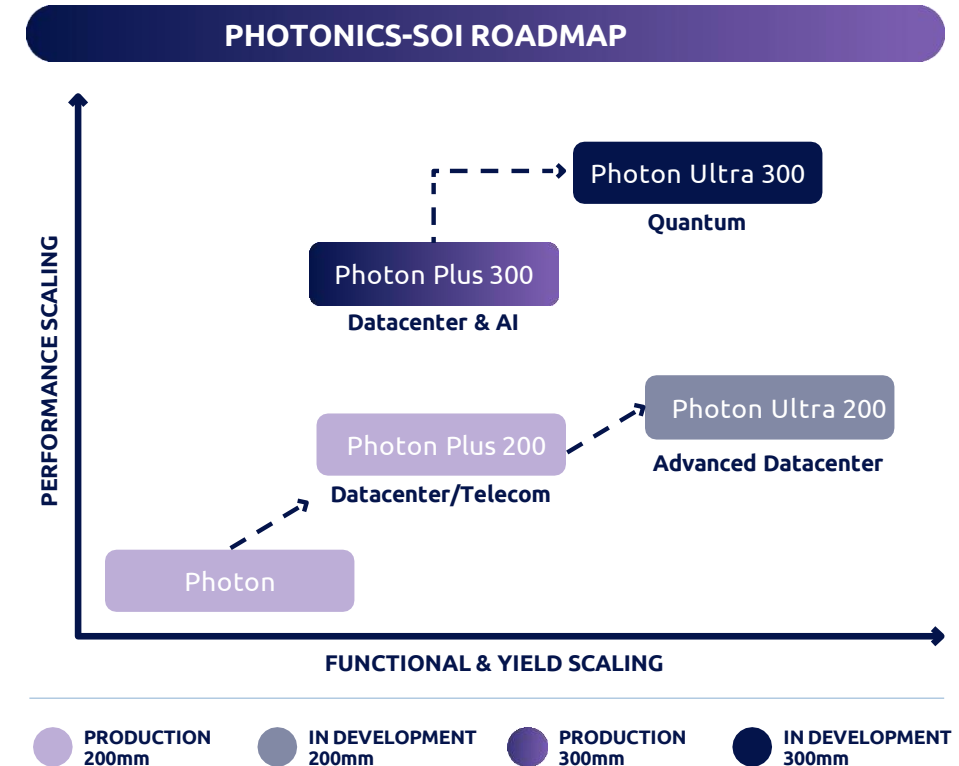
**FASTER DATA  
TRANSFER RATE**



**LOWER POWER  
CONSUMPTION**



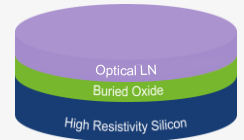
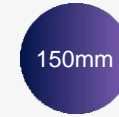
**SIMPLER  
PACKAGING**





# EDGE & CLOUD AI PRODUCT PORTFOLIO

## LNOI (LITHIUM NIOBATE ON INSULATOR \*)



### LNOI IS TARGETING ENERGY-EFFICIENT FAST DATA TRANSFER



General purpose datacenter



Telecom / Space / Military



Cloud AI

### OUR LNOI SUBSTRATE ENABLES



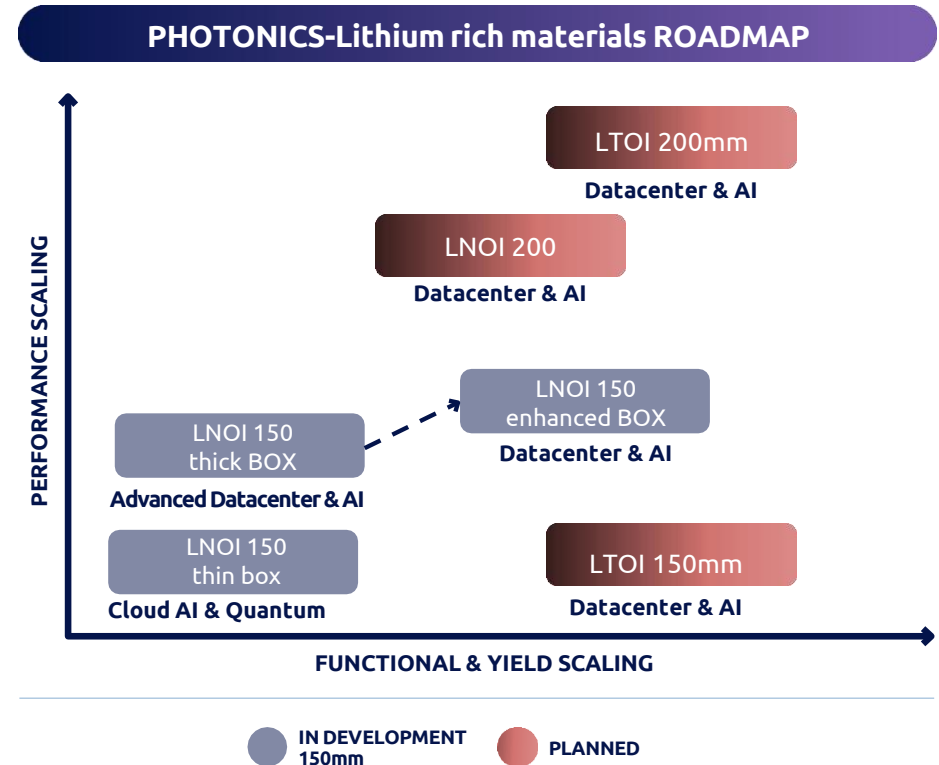
**FASTER DATA  
TRANSFER RATE**



**LOWER POWER  
CONSUMPTION**



**SIMPLER  
PACKAGING**

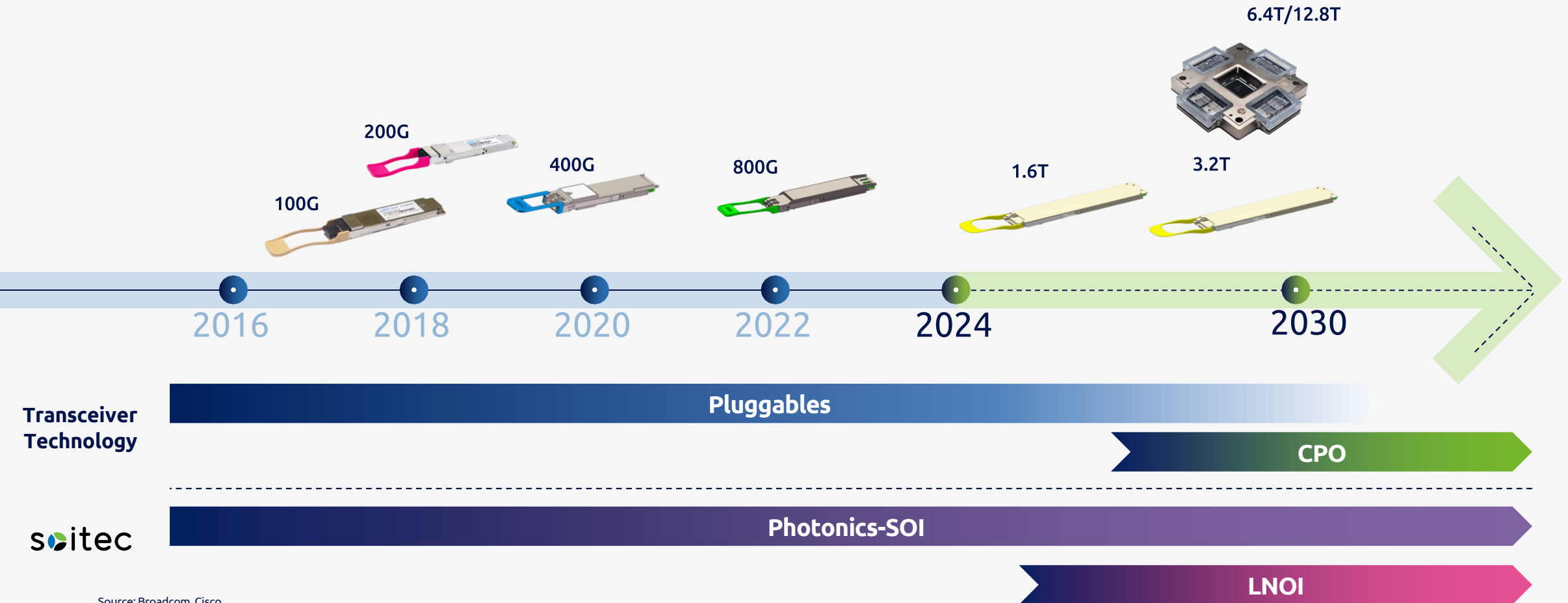


(\*) LNOI is also referred to as TFLN (Thin Film Lithium Niobate)  
Photo credit: © CSEM



## CLOUD AI ROADMAP

### SOITEC ENABLES ALL PRODUCTS FROM PLUGGABLES TO CPO

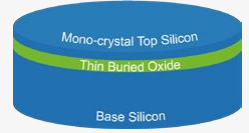


Source: Broadcom, Cisco



# EDGE & CLOUD AI PRODUCT PORTFOLIO

## IMAGER-SOI



### IMAGER-SOI TARGETS 3D STACKING IMAGERS



Secure 3D Facial Recognition



Advanced Embedded Image processing

### OUR IMAGER-SOI SUBSTRATE ENABLES



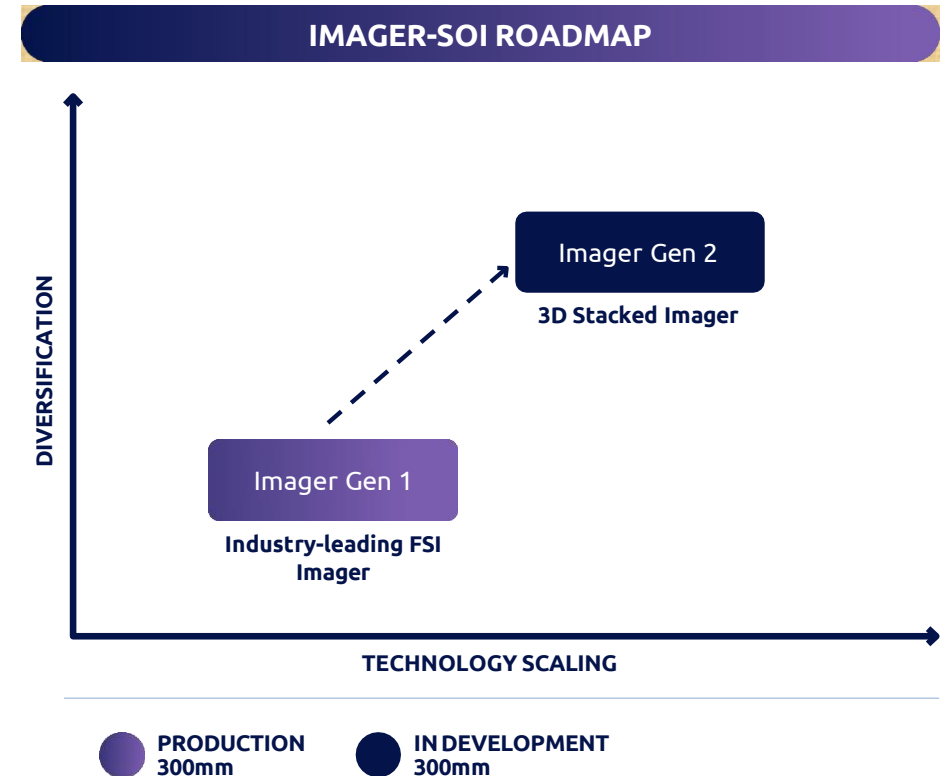
HIGHER RESOLUTION  
FOR SECURITY  
APPLICATION



INCREASE  
ON-CHIP IMAGE  
PROCESSING



IMPROVE  
DETECTION EFFICIENCY  
AND REDUCE POWER



# AI-NABLERS

## EXPANDING PRODUCT PORTFOLIO TO ENABLE FUTURE AI DEVELOPMENTS

		ACTIVE LAYER							
		Silicon	Piezo	SiC	InP	GaN	GaAs	Ge	Others
SUBSTRATE	Silicon or SOI								<div>Diamond</div> <div>GaOx</div> <div>2D materials</div>
	Sapphire								
	SiC or polySiC								
	GaAs								
	Device wafer								



# AI-NABLERS

## EXPANDING PRODUCT PORTFOLIO TO ENABLE FUTURE AI DEVELOPMENTS

AI-NABLER

		ACTIVE LAYER							
		Silicon	Piezo	SiC	InP	GaN	GaAs	Ge	Others
SUBSTRATE	Silicon or SOI	Low power Transistor isolation Radiation hardness Edge AI, 4G/5G, Datacenter, Imager	High performance RF filters 4G/5G	Co-integration Quantum	Co-integration Scalable to 300mm High performance 6G, SWIR, Imager	PA performance Co-integration 5G/6G, smartphones	Co-integration Scalable to 300mm Optoelectronics	Co-integration Scalable to 300mm High mobility Optoelectronics	Better performance Power electronics  Better performance HPC, IoT
	Sapphire	Transistor isolation Radiation hardness 3G/4G			Co-integration High performance Optoelectronics	High performance microLEDs	Co-integration High performance Optoelectronics	Co-integration High performance Optoelectronics	
	SiC or polySiC			Better performance Higher yield Greener technologies Power electronics		PA performance Co-integration 5G/6G, baseband			
	GaAs				Optical performance Optoelectronics		Optical performance Optoelectronics		
	Device wafer	Uniformity Crystal quality SoC integration 3D Sequential integration	Uniformity Crystal quality Yield Sensors, Actuators						



# SOITEC ENABLES THE AI REVOLUTION IN OUR DAILY LIVES



Face recognition



ADAS/AD



Health sensor



Real-time sound processing



Image generation



Voice recognition



Smart assistants



Smart City





ENABLING ARTIFICIAL INTELLIGENCE  
WITH ENGINEERED SUBSTRATES

THANK YOU