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SAMSUNG MEMORY

2018

Investor Presentation

CONTENTS

- **BUSINESS UPDATE**

MEMORY MARKET OPPORTUNITIES

SAMSUNG STRATEGY

SAMSUNG MEMORY BUSINESS REVIEW

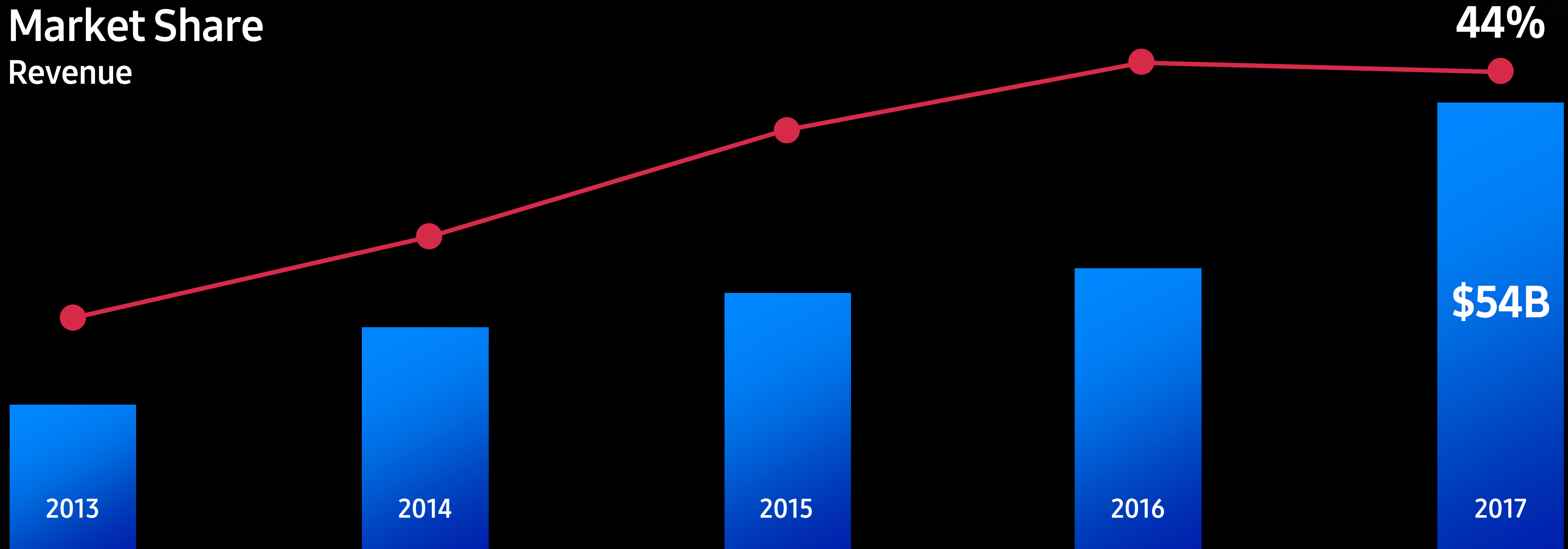
#1 in Memory Worldwide Since 1993, Well Balanced DRAM/NAND Portfolio

2017 Market Share

DRAM 45%

NAND 43%

Market Share
Revenue



MEMORY BIZ. PARADIGM SHIFT LED BY SAMSUNG

Samsung is Powering the Technologies that bring Innovation to Lifestyle

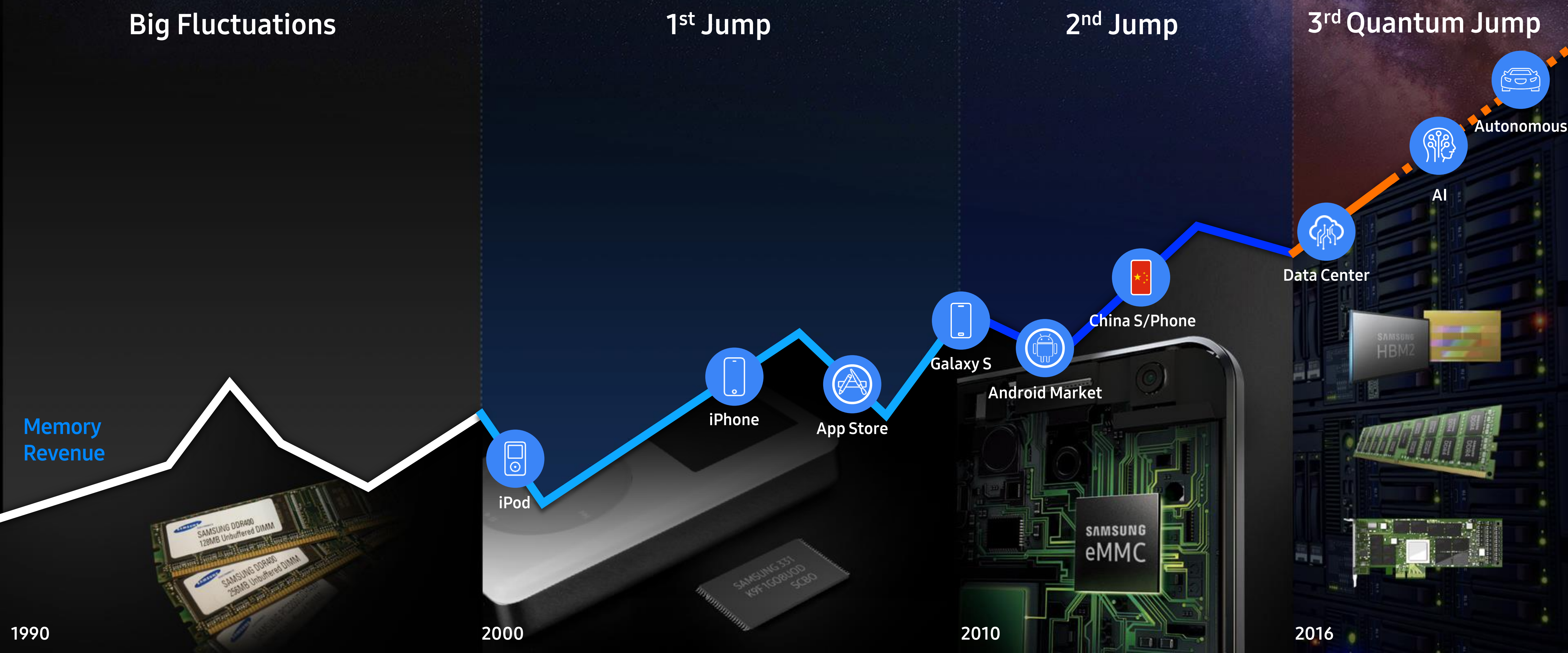
Big Fluctuations

1st Jump

2nd Jump

3rd Quantum Jump

Memory Revenue



Autonomous

AI

Data Center

China S/Phone

Galaxy S

Android Market

iPhone

App Store

iPod

SAMSUNG
eMMC

SAMSUNG
HBM2

2016

2010

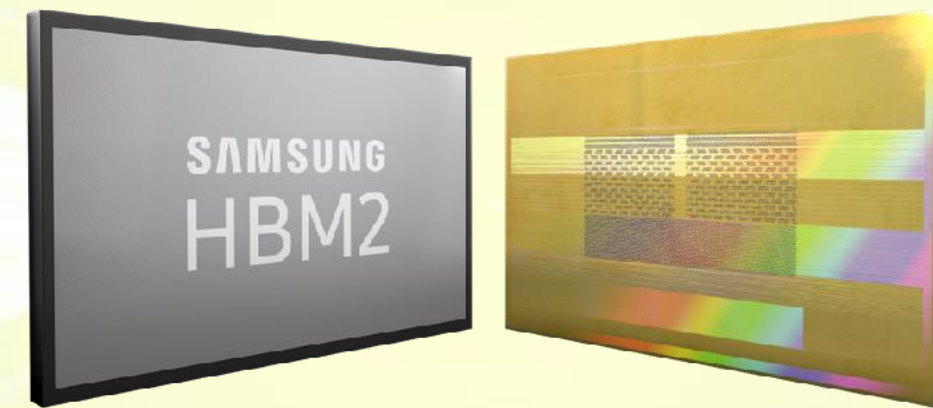
2000

1990

Beyond The Boundary

HUMAN

AI



Samsung Memory

CONTENTS

BUSINESS UPDATE

- **MEMORY MARKET OPPORTUNITIES**

SAMSUNG STRATEGY

SPREAD-OUT OF PUBLIC CLOUD

Explosive Growth of Unstructured Data

1st WAVE



Cloud Service Providers

2016

2nd WAVE



.Com & Forbes Top100

3rd WAVE



Telco Companies

2020

THE FLOOD OF DATA

4TH WAVE



Automotive Companies

SMART CITY & AUTONOMOUS CAR FUELED BY 5G NETWORK

Huge Amounts of Data Generated by Hyper-connected Devices



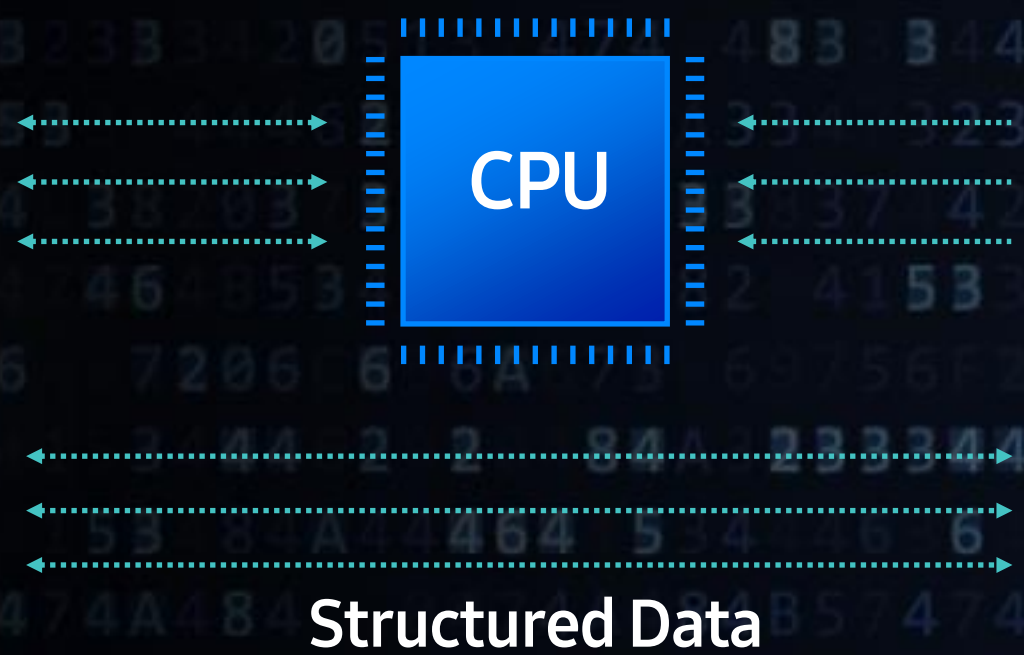
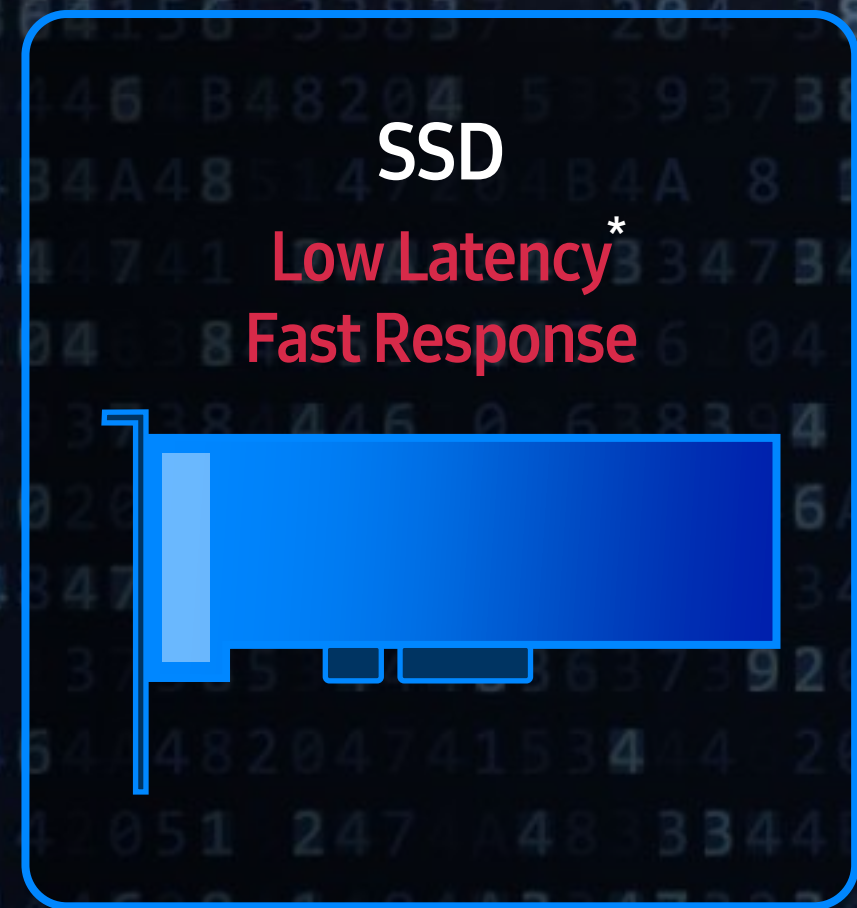
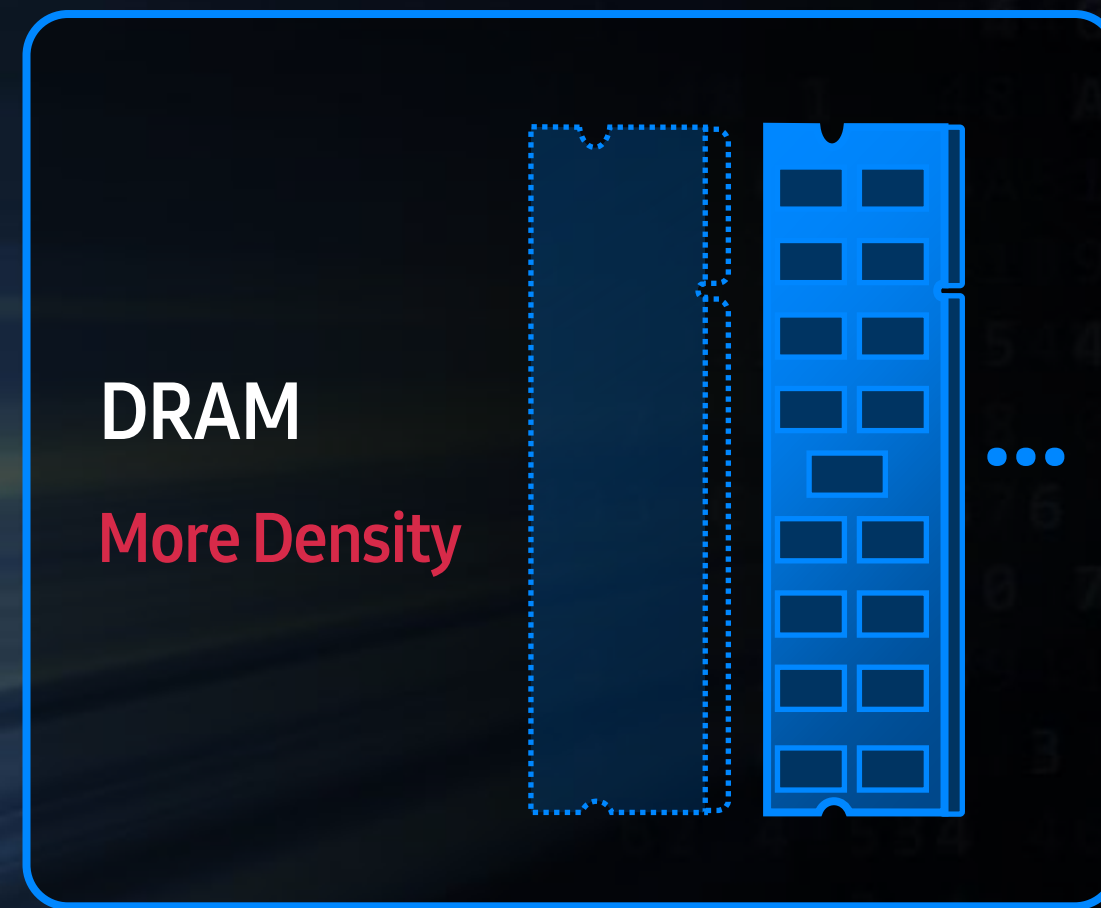
MARKET OPPORTUNITY IN BIG DATA ANALYTICS

Demand Increase for High Density & Performance Memory to Enhance Computing Power



**CLOUD
BIG DATA**

Un-structured Data

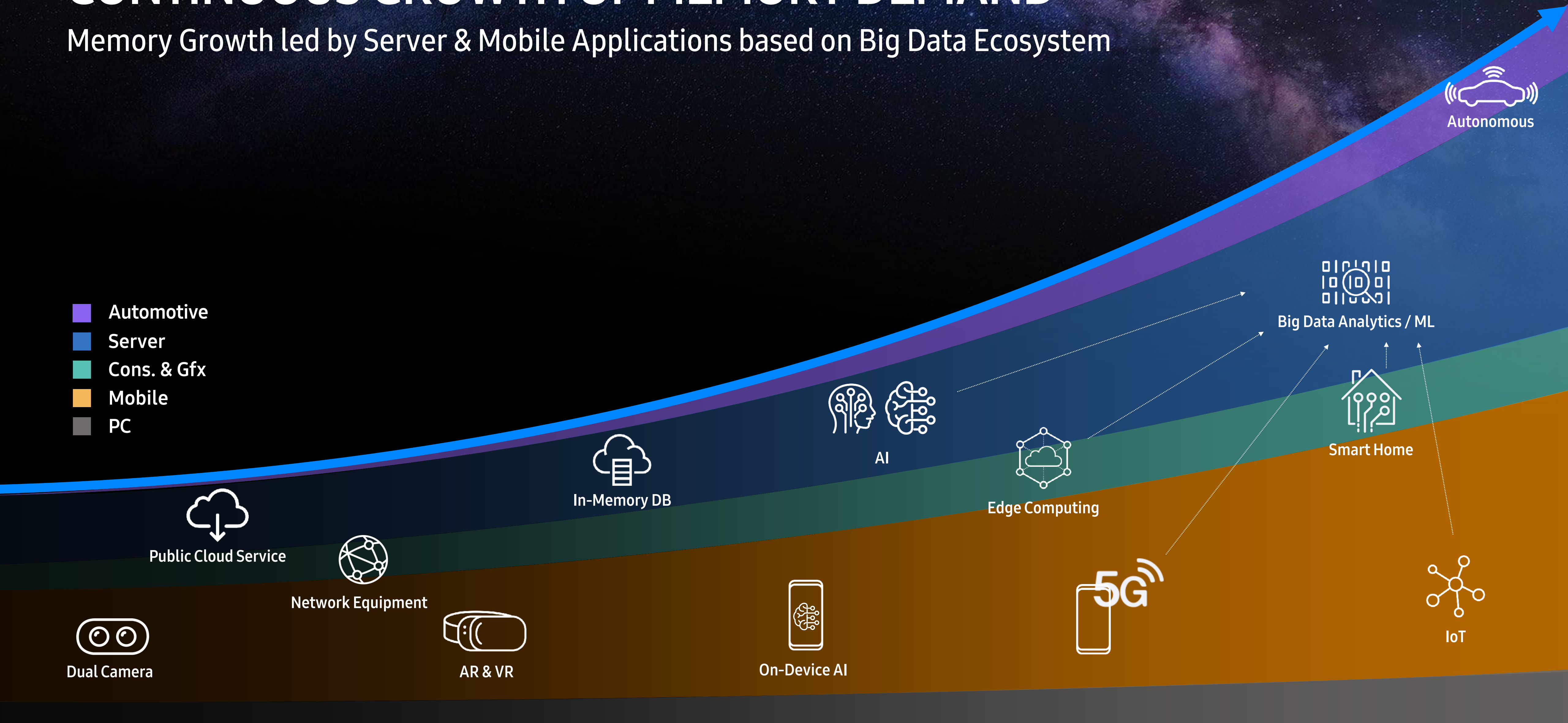


* Latency: Time Delay between input and output in a system

CONTINUOUS GROWTH OF MEMORY DEMAND

Memory Growth led by Server & Mobile Applications based on Big Data Ecosystem

- Automotive
- Server
- Cons. & Gfx
- Mobile
- PC



Dual Camera



Public Cloud Service



Network Equipment



AR & VR



In-Memory DB



AI



Edge Computing



5G



IoT



Smart Home



Big Data Analytics / ML



Autonomous

2017

2018

2019

2020

CONTENTS

BUSINESS UPDATE

MEMORY MARKET OPPORTUNITIES

- **SAMSUNG STRATEGY**

SAMSUNG STRATEGY

Break-through
Technology

COST LEADERSHIP

Enhanced
Solutions

S/W & CONTROLLERS

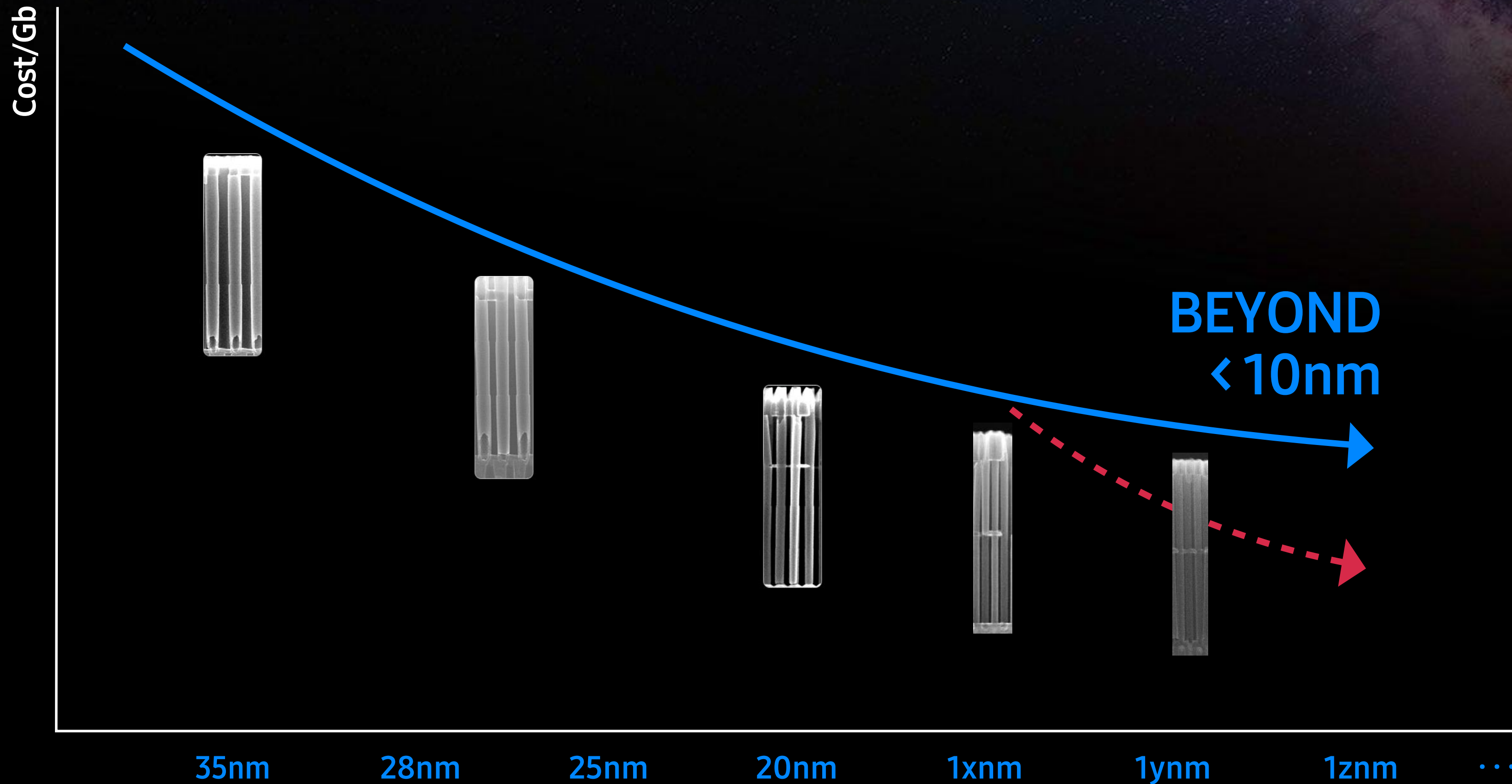
Advanced
Manufacturing

EFFICIENCY & FLEXIBILITY

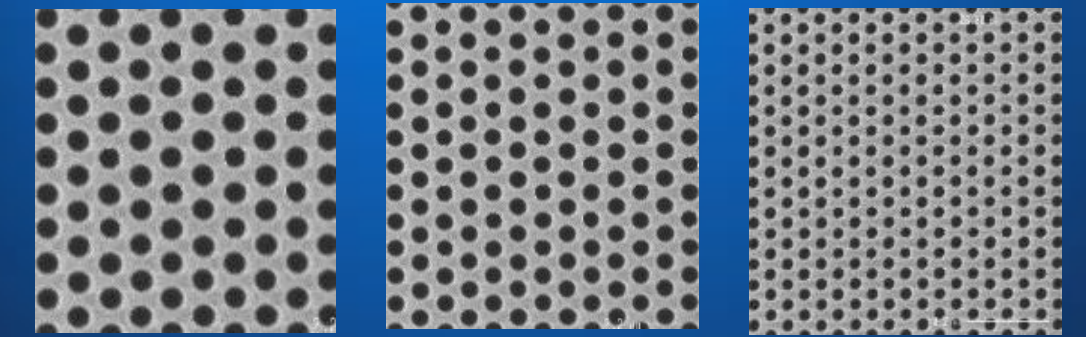
CONTINUOUS TECHNOLOGY SCALING

Thru Technology Evolution

DRAM

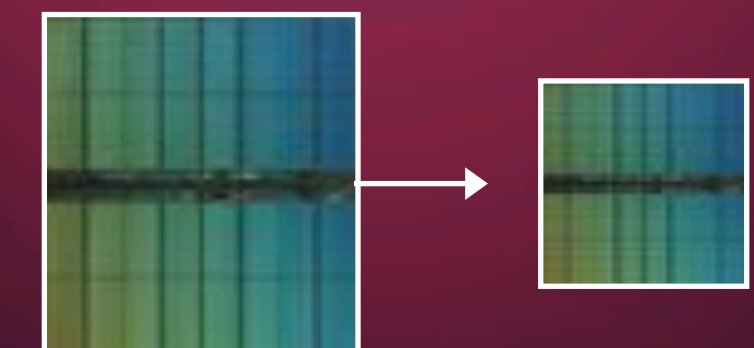


FUTURE DRAM TECHNOLOGY



- DPT
 - QPT
 - EUV
- *DPT : Double Patterning Technology
*QPT : Quadruple Patterning Technology
*EUV : Extreme Ultra Violet

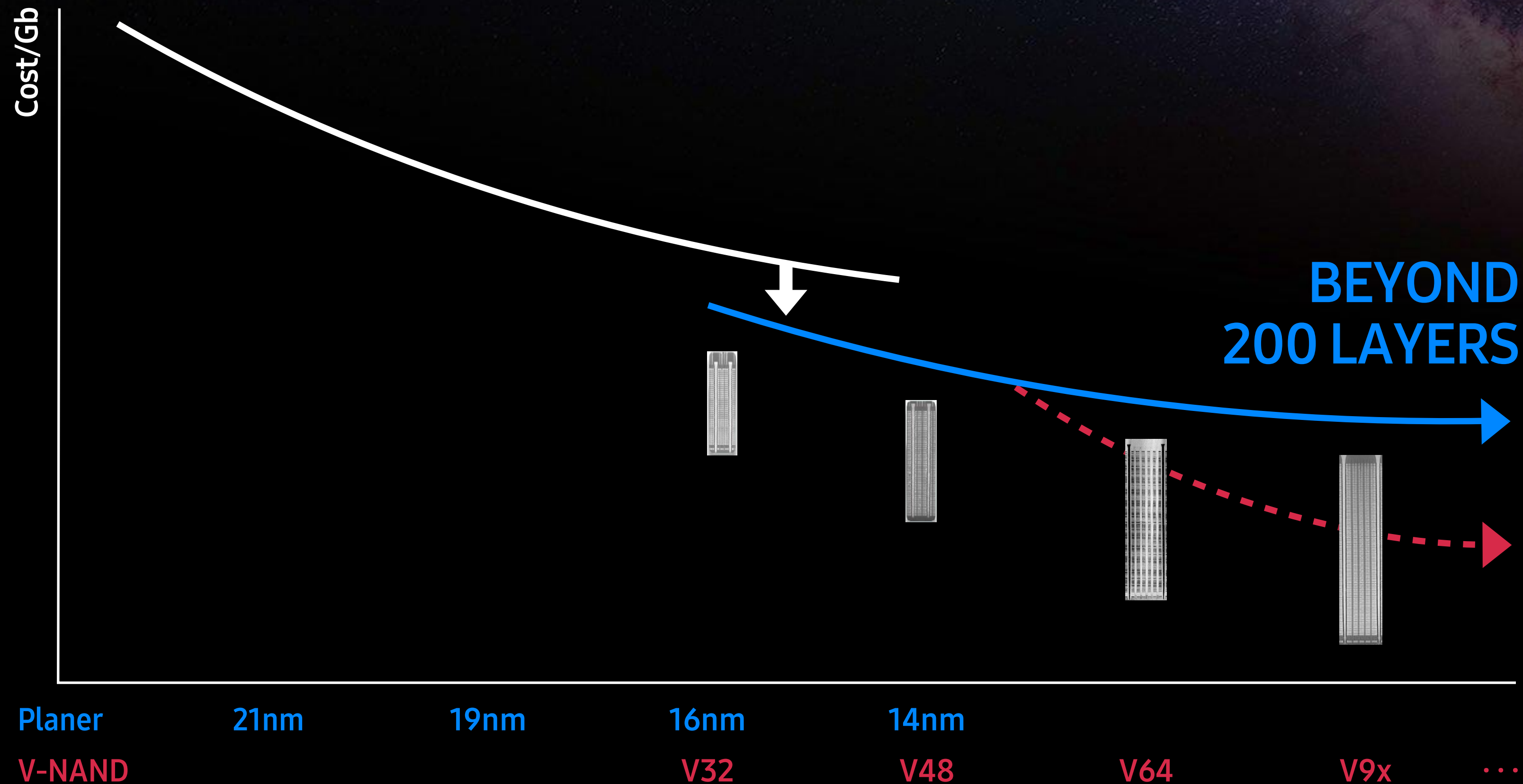
ADVANCED DESIGN TECH



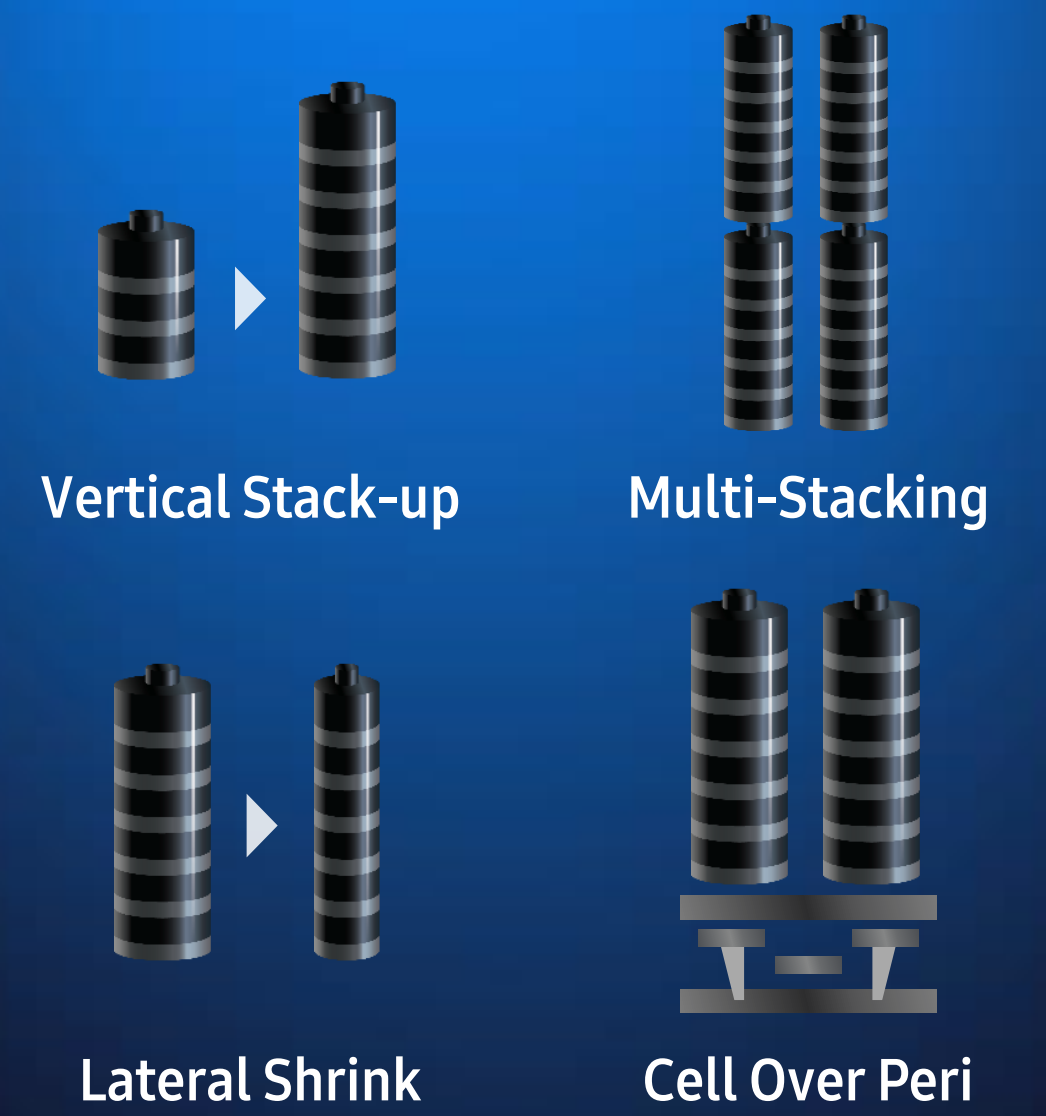
PUSHING THE LIMITS OF V-NAND

Thru Innovative Layer Stacking Technology

NAND



FUTURE V-NAND TECHNOLOGY



QLC



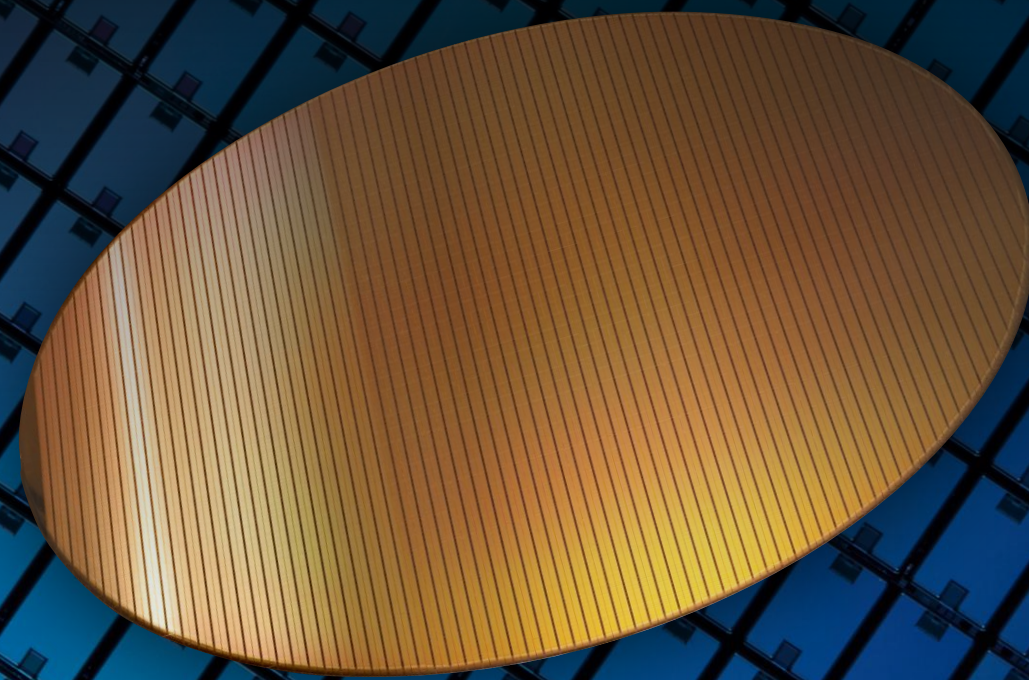
* QLC: Quad-Level Cell

UNIQUE CAPABILITIES FOR DIFFERENTIATED SOLUTIONS

Integrating Key Components to Deliver Value-added Solutions

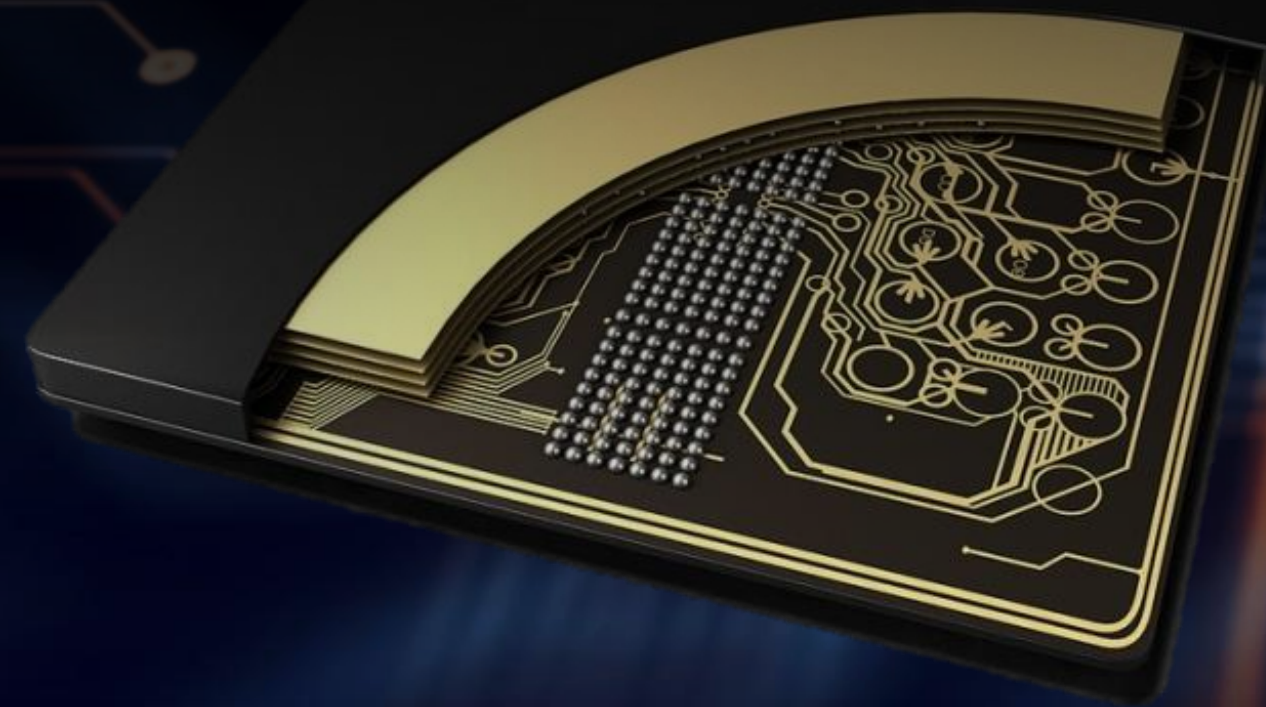
ADVANCED PROCESS TECHNOLOGY

Wafer / Chip



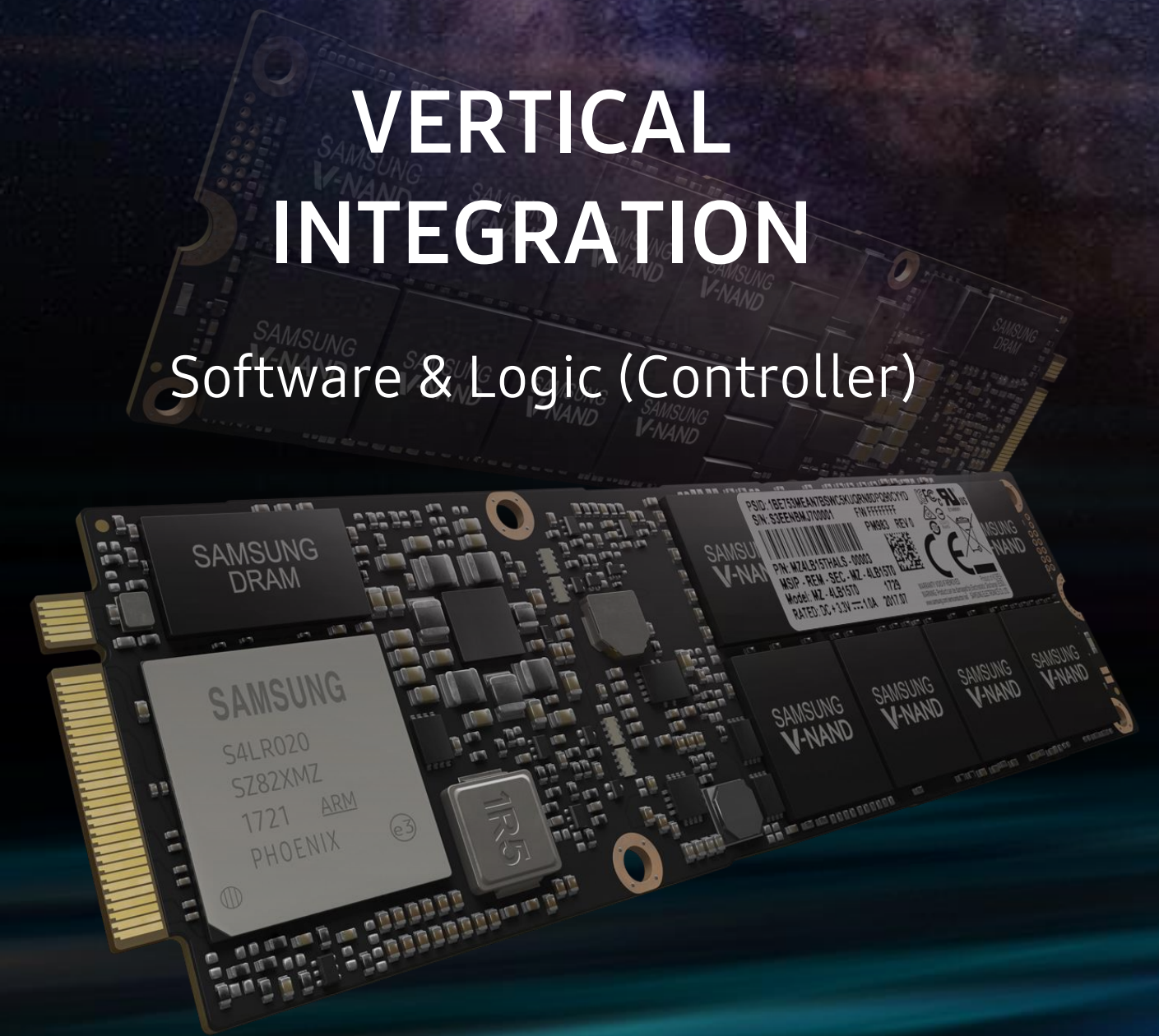
ADVANCED PACKAGING TECHNOLOGY

Stacking / TSV



VERTICAL INTEGRATION

Software & Logic (Controller)



Smaller



Higher Density



Less Power Consumption



Faster



Thinner



Smaller



No Performance Loss



Customized



Expandable



Smarter



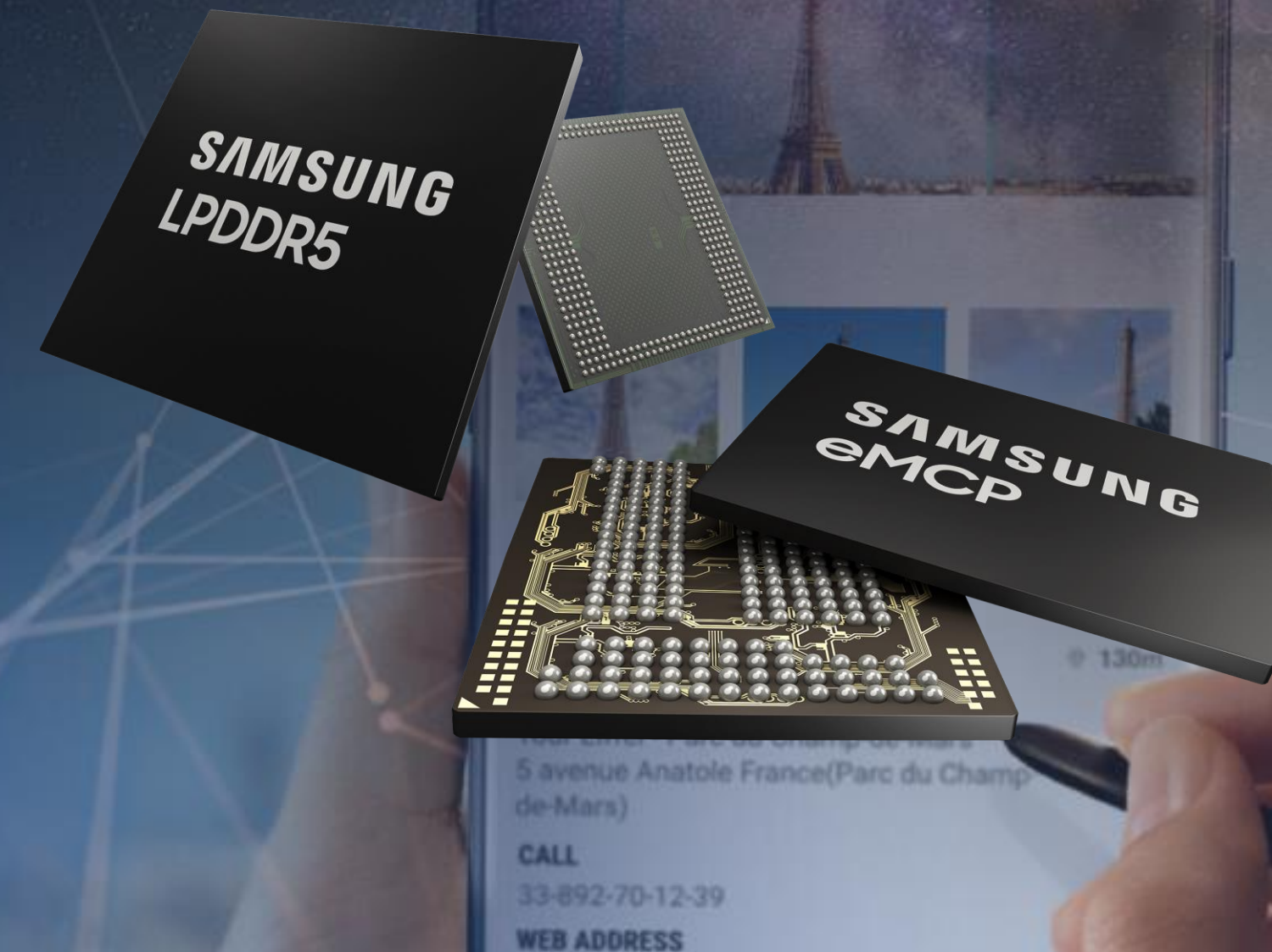
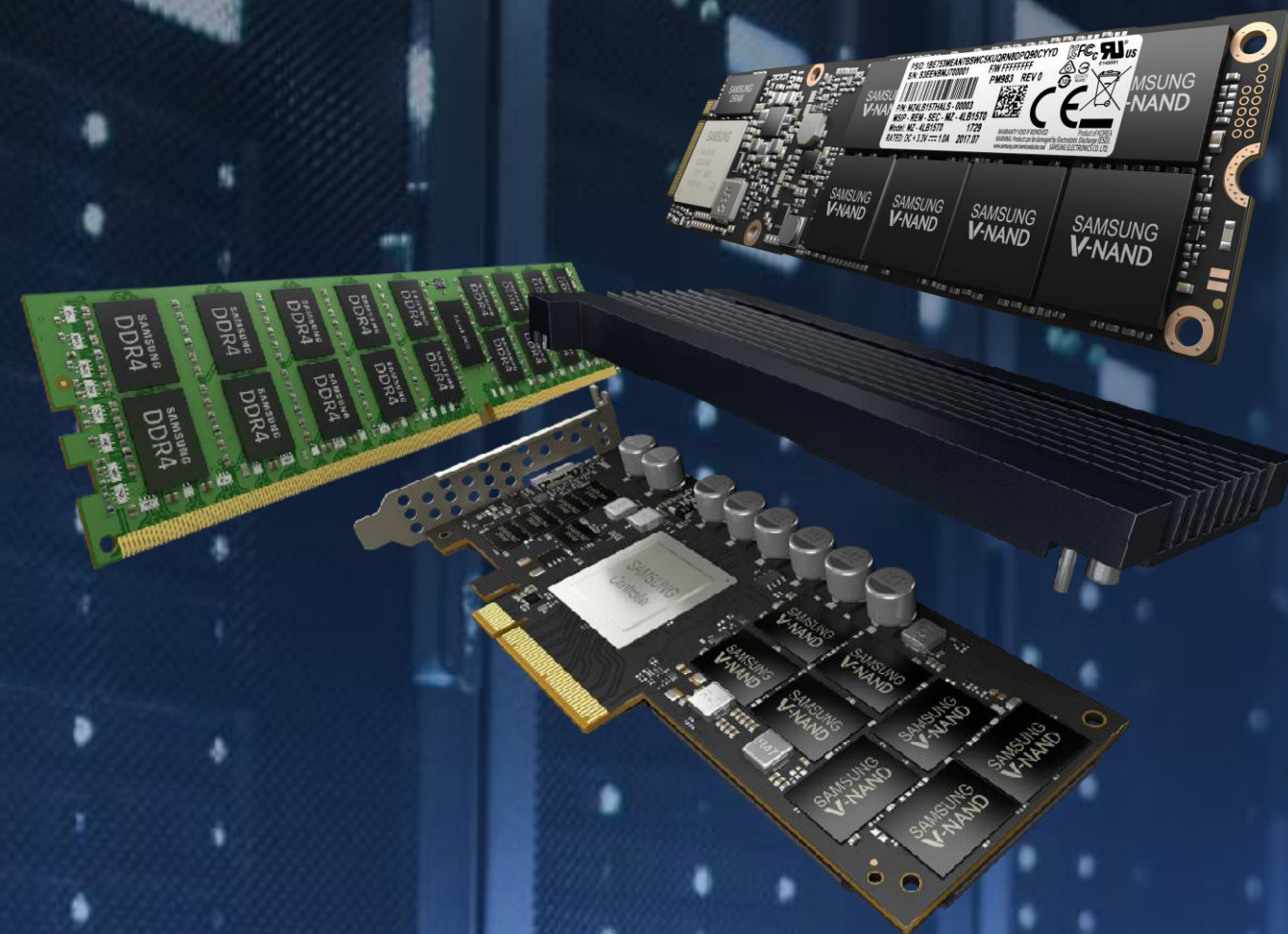
Secure

SAMSUNG SOLUTIONS FOR THE 5G ERA

Enhanced Processing for Massive Data with Lower Latency & Less Power Consumption

FASTER DATA RATES WITH LOW POWER

5G



TSV RDIMM, Z-SSD & NF1

- Low Latency*
- High Capacity
- Stable QoS

LPDDR5

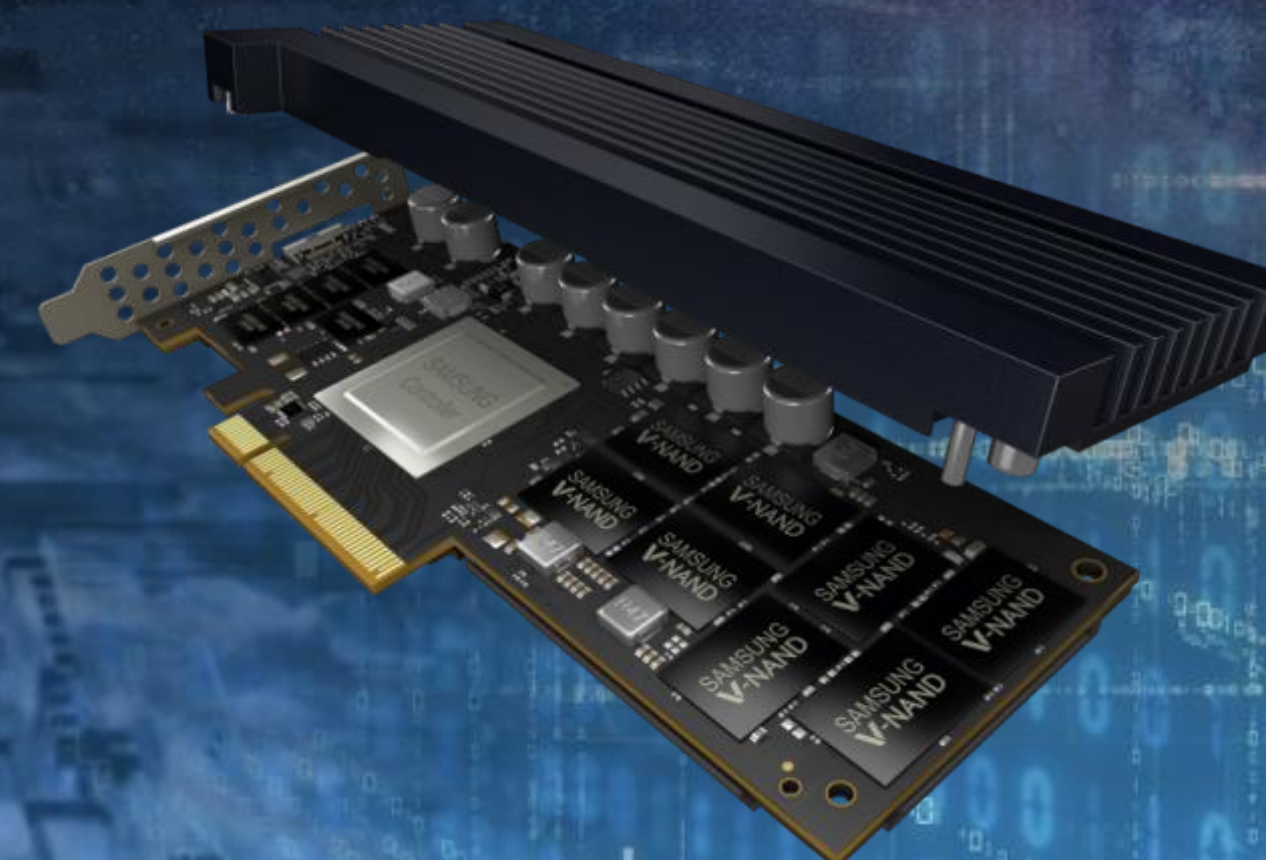
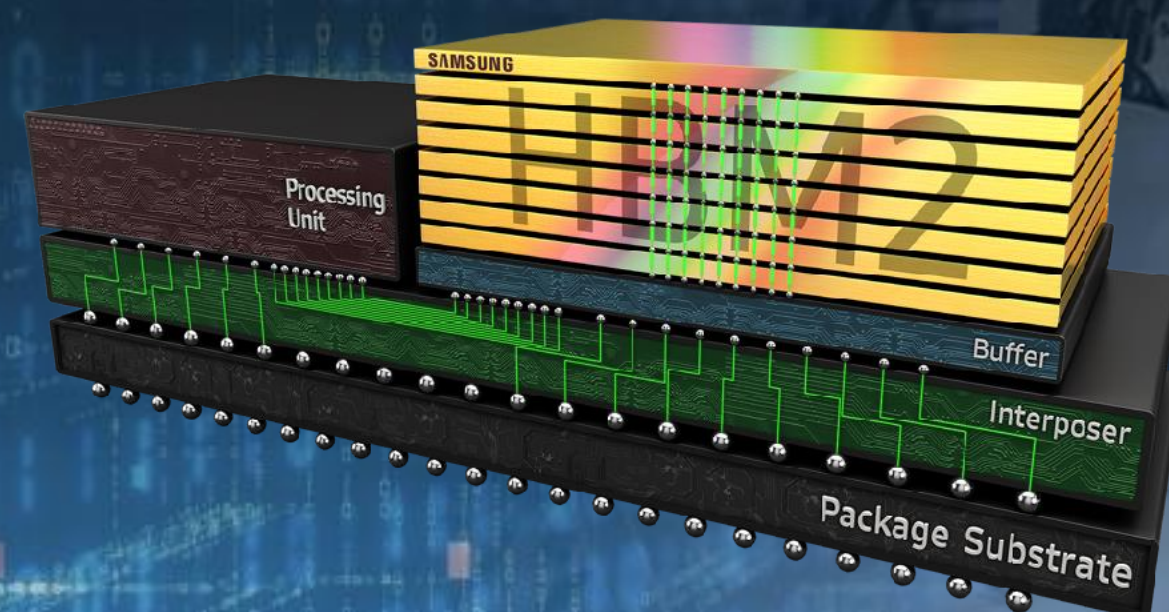
- Higher Speed
- Lower Power Consumption
- Smaller Package

* Latency: Time Delay between input and output in a system

SAMSUNG SOLUTIONS FOR ARTIFICIAL INTELLIGENCE

Superlative Performance and High Reliability Using Less Energy

ENHANCED PERFORMANCE
FOR DATA-INTENSIVE TASKS



8GB HBM2*

Fastest Performance

Energy Efficiency

32TB SAS SSD, 16TB NVMe SSD

Largest Density

Higher Reliability

Unparalleled Performance

* HBM: High Bandwidth Memory

SAMSUNG SOLUTIONS FOR AUTOMOTIVE INDUSTRY

Advanced Total Memory Solution for Automotive Applications & Connected Car

Dedicated Support for automotive

Diverse Memory Line-ups

Dedicated Manufacturing Line & Organization

ELECTRIFIED



CONNECTED



AUTOMATED



Automotive eStorage

High Density

Temperature Notification

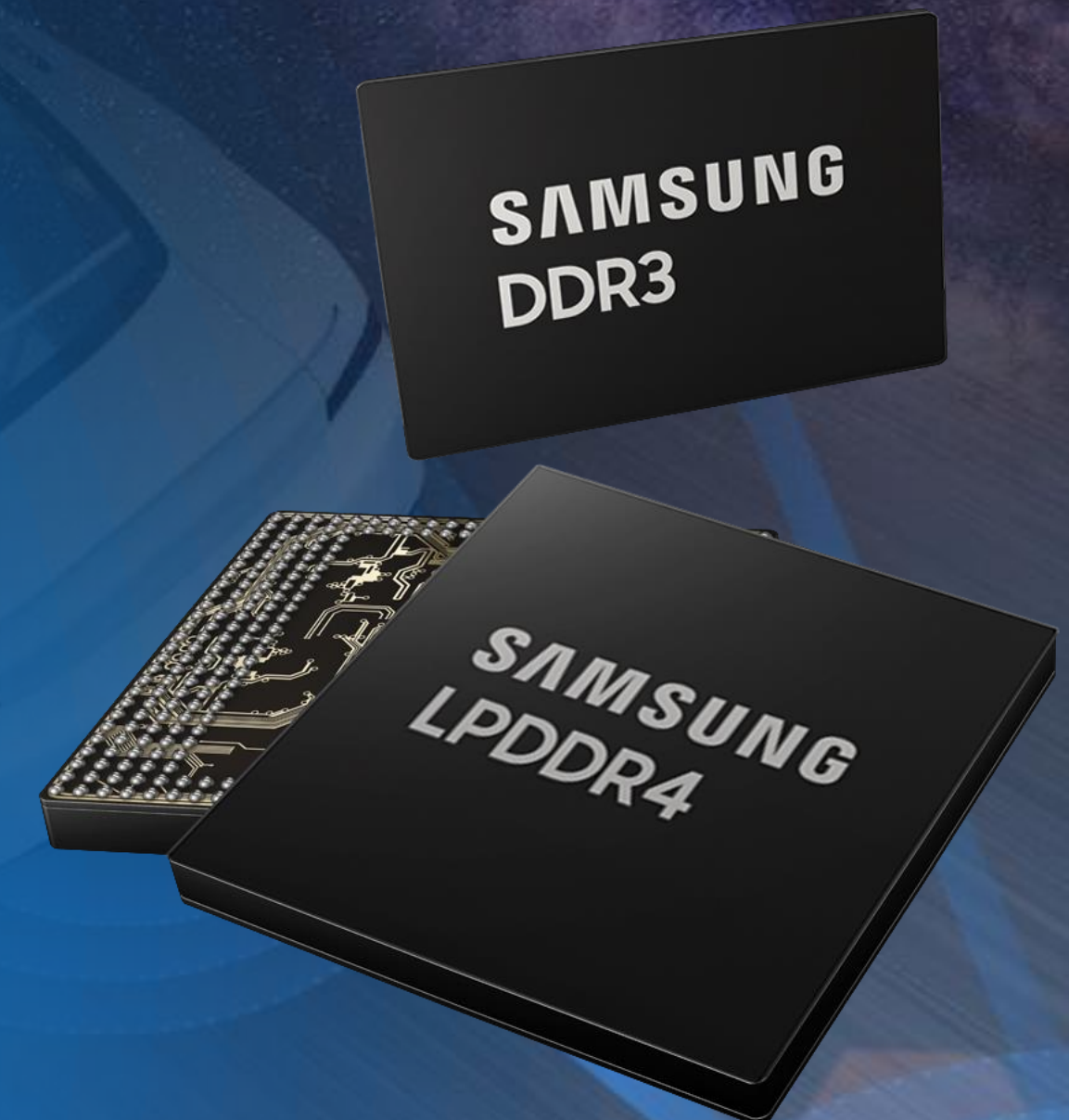
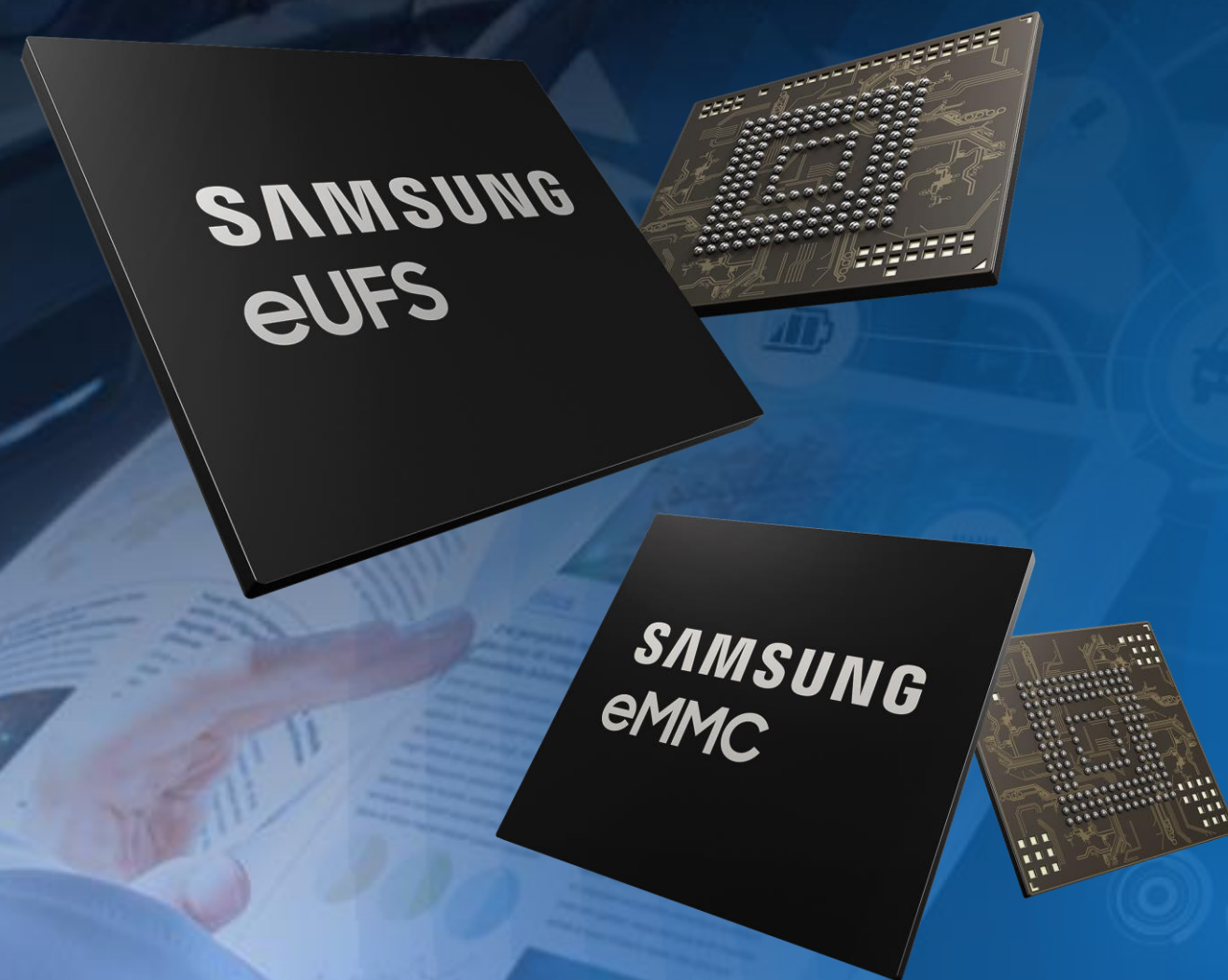
Data Refresh

Automotive DRAM

High Bandwidth

Lower Power Consumption

Higher Reliability



APPLICATION-ORIENTED LINE MANAGEMENT

2-Track Strategy for Efficient Production & Capacity Allocation

ARTIFICIAL
INTELLIGENCE

HIGH
PERFORMANCE
COMPUTING

AUTOMOTIVE

INDUSTRIAL

NETWORK

PERFORMANCE

Leading Process Technology

FLEXIBILITY

DRAM/NAND Conversion

LONGEVITY

Proven Process Technology

EVOLUTION TO SMARTER FACTORY

Customer Value Improvement through High Productivity and Enhanced SCM*

SCM

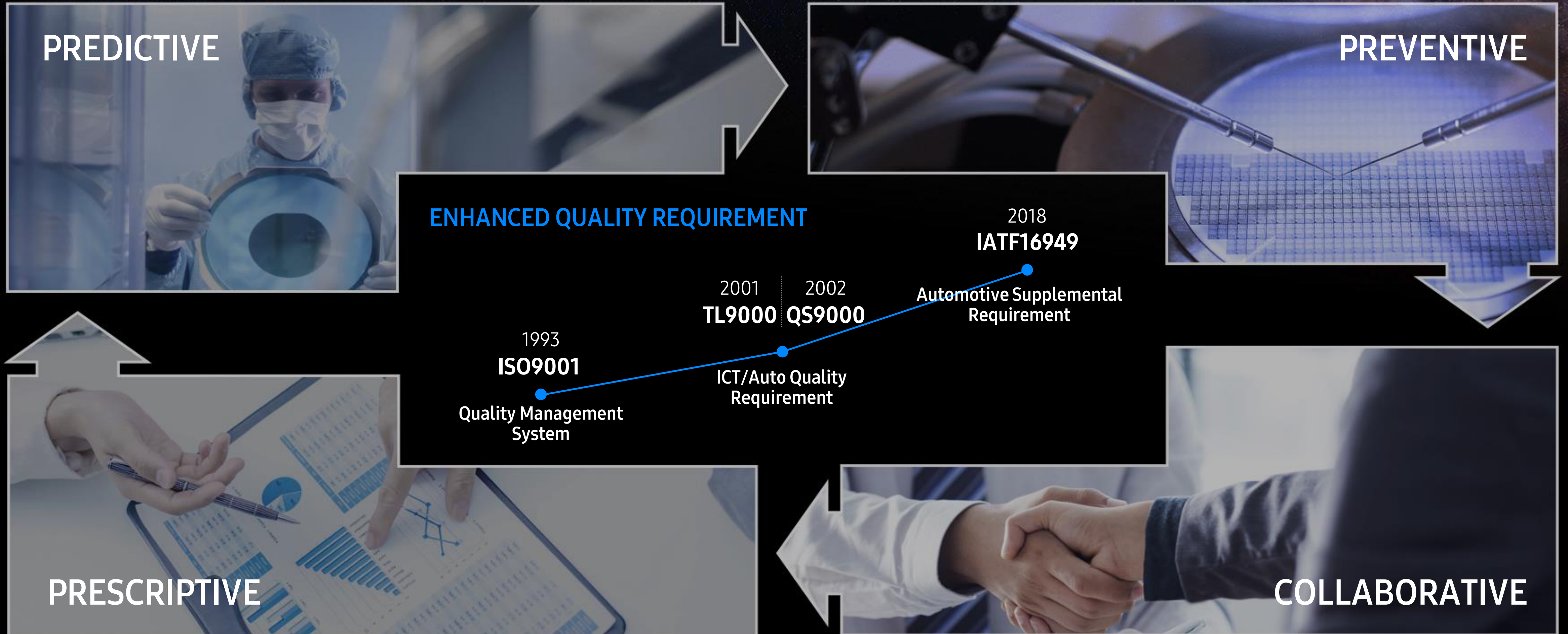
PRODUCTIVITY



* SCM: Supply Chain Management

QUALITY BY DESIGN

Meet the Industry Standard and Expectation of AI & Automotive Customers



Placing Memory at the Forefront of Future Innovation and Creative IT Life

Technology

Leading Technological
Breakthroughs

Customers

Supporting Customers'
Future Innovation

Employees

Fostering Employees'
Creativity

Society

Enriching a New Way of
Digital Life