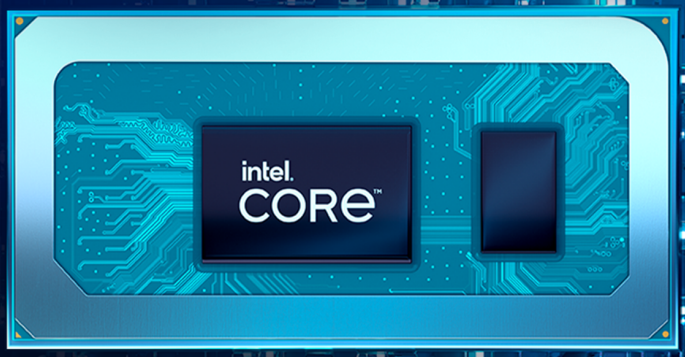
WHITE PAPER

13th Gen Intel® Core™ Mobile Processor
Raptor Lake-P: The Future of Automation & Industrial Internet of Things



Raptor Lake-P: The Future of Automation & Industrial Internet of Things

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Introduction

Global manufacturing is currently undergoing the Fourth Industrial Revolution (4IR). It is a digital transformation in the industrial sector that comprises discrete and process automation, robotics, cloud computing, Artificial Intelligence (AI), machine learning, Industrial Internet of Things (IIoT), and many other technology trends. To put it bluntly, Industry 4.0 is the introduction of a vast range of digital technologies in manufacturing.

In line with the opportunities brought by 4IR, the global manufacturing industry is determined to realize and practice key leaps to take manufacturing to the next level. In this regard, original equipment manufacturers (OEMs) are always actively creating improved and innovative automation solutions for their end customers to enhance their operations, such as process manufacturing in the food and beverage industry or discrete manufacturing in the automotive industry.

If one were to summarize 4IR, it could be to connect the unconnected, integrate smart technology, and increase automation with advanced analytics.

With the worldwide shift in consumption demand, sustainability goals, workforce shortages, and other disruptions, there is a need for factories to enhance operational efficiency and productivity, and reduce downtime and CapEx/OpEx, while significantly adhering to increasing quality standards.

On the path of realizing the 4IR transformation, industrial players are eyeing purpose-built systems that are capable of meeting the diverse requirements to achieve the industrial transformation goals.

Some crucial sought-after system requirements include:

(i) Higher compute performance
(ii) AI-Ready
(iii) Virtualization technology to drive workload consolidation
(iv) Security & Manageability capabilities
(v) Reliability features such as ECC memory support and operation in harsh environment
(vi) Robust Durability to meet harsh factory environments (extended temperature)

From the above requirements, it becomes evident that what the industry needs to embrace 4IR is a powerful, versatile, smart, more secure, and durable processor. With that, Intel is proud to present a perfect candidate – the **Raptor Lake-P**, the 13th-Generation Intel® Core™ Mobile Processor.

Raptor Lake-P – 13th Gen Intel® Core™ Mobile Processor

Raptor Lake-P is Intel's industrial-grade mobile processor. Raptor Lake-P provides an incremental set of crucial industrial features vital to the manufacturing and energy sector, along with a significant increase in instructions-per-cycle performance from the 12th Gen Core Mobile Processor. Moreover, Raptor Lake-P also comes with long-life hardware availability of up to 10 years and software support of up to 5 years.*

Key Features

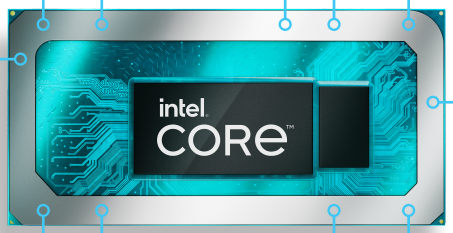
Hybrid Architecture
Hybrid Architecture Best of both worlds – CPU Architecture with performance (P-cores) and efficiency (E-cores) to meet the needs of diverse workloads

Intel® Iris® Xe Graphics – Dedicated GPU
Support industrial visualization needs – allows up to 4 simultaneous 4K HDR displays

Peripheral Component Interconnect Express (PCIe) 4.0 & 5.0
Increased bandwidth for higher flexibility, as well as faster storage speed, graphics & connectivity – all features crucial for factory applications such as machine vision, Robotics, edge servers, etc.

Intel® Time Coordinated Computing (TCC)
TCC defines a set of features that augments the compute performance of Intel processors to address the stringent temporal requirements of real-time applications

Integrated Time-Sensitive Networking (TSN)
Enable real-time communication among industrial devices – incorporate accurate, time-sensitive data into industrial processes, as well as provide a detailed and holistic view of operations to facilitate swift responses to market demands in real-time



Wide range of operating temperatures (-40 to +100 °C)
Extended temperature range to suit harsh environments

Industrial Use Condition
Support 100% active operation for 10 years

DDR5 / LPDDR5x with In-Band Error-Correcting Code (ECC)
Eliminate memory errors, data corruptions, or event system crashes

Ball Grid Array (BGA) package with low TDP (15W)
Contribute to high mechanical integrity in an industrial environment with high levels of vibrations

Long Life Availability (10+ years)
Help businesses with a longer product lifecycle

Intel® vPro Platform with Intel® Active Management Technology (AMT)
Built for business – with enhanced security and remote manageability

Examples of Industrial Applications

With all its remarkable industrial features, Raptor Lake-P can be utilized in numerous industrial systems and devices. Here are a few examples:

- **Industrial Computer (IPC)**
  Generally, IPCs are devices capable of bridging information technology (IT) systems with operational technology (OT) systems to automate factories for IIOT; running multiple workloads; providing quick connectivity between secure on-premise and cloud applications; and are compatible with modular hardware upgrades for AI, machine vision, etc. Besides, IPCs are built with a ruggedized design, wider operating temperature range, industrial-grade components, etc., allowing versatile usages irrespective of environment, harsh or temperate.

- **Industrial Controller**
  An industrial controller refers to a computer-based device specialized for controlling discrete and process operations. With the real-time technology of Intel® TCC & integrated TSN Ethernet, Raptor Lake-P helps attain the high deterministic requirements for vital factory functions or temperate.

- **Machine Vision**
  Machine vision technology enables industrial equipment to "see" and "decide" its next move. It is especially crucial in industrial automated processes such as defect & anomaly detection and predictive maintenance & analytics. With integrated Xe Graphics, hybrid cores, and specialized Vector Neural Network Instructions (VNNI), Raptor Lake-P is the perfect choice for next-gen industrial machine vision applications.

- **Industrial Robotics**
  Robots play a critical role in the industrial environment: they gather information about surroundings with sensors like vision, proximity, and tactile, and other inputs like gesture and voice, which are inputs for robots to plan and act accordingly. Hardware accelerator to offload AI-based decision-making, rich set of I/Os, along with real-time features allow Raptor Lake-P to be well positioned as the next-gen industrial robot controller platform.

Software & Toolkits

Apart from providing industrial-grade hardware, the appeal of Raptor Lake-P also lies in its strong line-up of software and toolkit support, which among others, include:

Intel® Edge Insights for Industrial	Generate useful insights for operation improvement by processing and interpreting a large amount of time series, image/video, and audio data at the edge with enhanced AI capabilities
Intel® Edge Controls for Industrial	Offer a vast range of IT-style technologies, including containerization, virtualization, and orchestration, while meeting industrial-grade requirements for deterministic traits and high levels of operational availability
Intel® Distribution of OpenVINO™ Toolkit	Enhance machine vision inference through a simplified process of deep learning model development, optimization, and deployment
Intel® OneAPI	Allow developers to use a single unified code base across multiple architectures, offering accelerated computing without vendor lock-in

Conclusion

To stand out in the midst of 4IR, having the right system is of utmost importance. Raptor Lake-P, alongside its readily compatible set of useful and formidable software, is no doubt, one of the top choices to handle the demanding role needed for Industrial transformation. Raptor Lake-P enables industrial system builders to create power-efficient platforms to seamlessly achieve IT-OT integration by accelerating AI inference and consolidating deterministic and non-deterministic workloads into a single platform. In tandem, the software solutions and tools help system builders to bring industrial solutions faster to market. The integrated hardware features are designed to truly build the next generation of digital factories for green and sustainable tomorrow.

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