



5G Core Performance and Power Savings

Intel delivers unmatched capabilities for a cloud-native 5G standalone core.

February 27, 2023 — Intel Corporation today at MWC 2023 announced an industry-first, 1 terabit per second (Tbps) 5G user plane function (UPF) performance demonstration and the new Intel® Infrastructure Power Manager for 5G Core reference software. The energy-efficiency of Intel processors when combined with reference software significantly reduces runtime power consumption in the 5G core without any compromise to key telco performance metrics.

Why Intel?

Intel architecture is the backbone of cloud-native, software-defined core networks around the world. As the primary choice for operators, equipment builders and software providers, Intel® Xeon® platforms set the bar for maximum 5G core workload performance and lower operating costs. Intel is breaking ground again by further reducing network costs and energy consumption with the following announcements with 4th Gen Intel® Xeon® Scalable processors:

- Demonstration of the industry's first 1 Tbps of performance for the 5G UPF workload with a single dual-socket server.¹
- New Intel Infrastructure Power Manager reference software that delivers an average run time power savings of 30% while maintaining key telco performance metrics by dynamically matching CPU power consumption to traffic.² On a per-year basis, this could result in multi-gigawatt hours (GWH) of power saved, millions of dollars of operating expense (OPEX) cost savings and significant carbon emissions offset.³

What is the Intel Infrastructure Power Manager?

Resulting from a deep collaboration with SK Telecom and already showing industry proof points with Nokia, NEC, Casa and others, the Intel Infrastructure Power Manager for 5G core is reference software that dynamically matches runtime server power consumption with data traffic without compromising key performance indicators such as throughput, latency and packet drop.

Who is the Intel Infrastructure Power Manager for?

The software is developed for integration by 5G core network function software vendors in their solutions for operators. This software significantly reduces time-to-market by simplifying access to key capabilities in 3rd Gen and 4th Gen Intel Xeon Scalable processors, like power telemetry, granular power control states and low-latency frequency change.

What are the benefits of the Intel Infrastructure Power Manager to operators?

By utilizing Intel Infrastructure Power Manager, operators can see an immediate impact to their power savings as they work toward their OPEX savings and sustainability goals. (See customer testimonials below for more information.)

When will the Intel Infrastructure Power Manager be available?

The reference software is available for validation by 5G core network function software vendors immediately. The first release of the software is targeted for delivery in early Q2 2023.

Is there a roadmap of software releases?



The first release is developed for runtime power savings for the user plane. Future releases are planned with additional power management capabilities and control plane support.

What should operators do next?

Customers should visit the Intel booth at MWC to see the demonstration. Customers should also work with their 5G core network function software vendor or contact Intel to learn more about the Intel Infrastructure Power Manager.

Endorsements and Testimonials

Samsung achieved 912 Gbps throughput performance of its 5G core UPF workload running on 4th Gen Intel Xeon Scalable processors with commercial features enabled. See the demonstration at the Intel stand #3E31 at MWC 2023.

SK Telecom and Intel collaborated on the runtime dynamic power management innovation for 5G core infrastructure. Tests based on SK Telecom's 24-hour traffic profiles show up to 55% power savings per day and can enable a reduction of 10 gigawatt hours of power and 5,000 tons of carbon emissions. See SK Telecom's [news release](#) for more details.

NOKIA engineers measured a 30% improvement in 5G core UPF performance using 4th Gen Intel Xeon Scalable processors over the previous generation. In addition, by using the Intel Infrastructure Power Manager for 5G core software, power savings of up to 43% was measured for the same power-hungry function. See Nokia's [blog](#) for more information.

NEC and Intel's long-term collaboration on runtime power management capabilities has significantly contributed to the maturity of the Intel Infrastructure Power Manager for 5G Core. When running this software with the NEC 5G UPF and CoSP traffic profiles over a 24-hour period, NEC achieved a reduction in CPU power consumption of over 30%. See NEC's [news release](#) for details.

Ericsson is at MWC and is showcasing real-time energy savings by utilizing the power management features of the Intel 4th Generation Xeon Scalable processors.

Casa Systems announced test results and plans to integrate the Intel Infrastructure Power Manager for 5G core reference software with its portfolio of cloud-native 5G network solutions. The integrated solutions will support communication service providers' efforts to reduce energy consumption, operational expenses and carbon emissions from network operations. Tests show a reduction in average CPU power over a representative 24-hour period of a CoSP traffic profile.

Hewlett Packard Enterprise will be at MWC showing its server technology that hosts the breakthrough 5G core performance and power demo running on 4th Gen Intel Xeon Scalable processors. See the demo in the Intel stand #3E31.

Quanta Cloud Technology is showcasing a demo at MWC of its power monitoring and visualization solutions. This demo will show how using the Intel® Telemetry Insights can influence the use of power management features.



Availability of accelerators varies depending on SKU. Visit the [Intel Product Specifications page](#) for additional product details.

Performance varies by use, configuration and other factors. Learn more at <https://www.intel.com/PerformanceIndex>.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See configuration disclosure for configuration details. No product or component can be absolutely secure.

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Disclaimers

¹ Tested by Intel as of 01/27/23.

1-node, 2x Intel(R) Xeon(R) Platinum 8470N CPU, 52 cores(104 Total), HT On, Turbo Off, Total Memory 1024GB (16x64GB DDR5 4800 MT/s [4800 MT/s]), BIOS EGSDCRB1.SYS.0093.D22.2211170057, microcode 0x2b000130, 6x Intel E810-2CQDA2 (CVL, Chapman Beach, Total – 6x100G ports), 1x Intel E810-CQDA2 (CVL, Tacoma Rapids, Total – 2x100G ports) 1x 447.1G INTEL SSDSCCKB8 , 1x 931.5G CT1000MX500SSD1, Ubuntu 22.04 LTS, 5.15.0-53-generic, UPF(GCC 9.4.0/Clang9.0.0,DPPK 22.07,VPP 20.09)

² Tested by Intel as of 01/26/23.

1-node, 2x Intel(R) Xeon(R) Gold 6438N CPU, 32 cores, HT On, Turbo Off, Total Memory 512GB (16x32GB DDR5 4800 MT/s [4000 MT/s]), BIOS EGSDCRB1.SYS.0090.D03.2210040200, microcode 0x2b0000c0, 2x Intel E810-2CQDA2 (CVL, Chapman Beach, Total – 4x100G ports), 1x 223.6G INTEL SSDSC2KB240G8, 1x 745.2G INTEL SSDSC2BA800G3, Ubuntu 22.04 LTS, 5.15.0-27-generic, GCC 7.5.0, DPPK 22.11

³ Estimated by Intel as of 02/21/23.

Calculations: OPEX power energy cost savings per year: Total number of CPUs X (CPU TDP in KW x POWER SAVINGS) X PUE X (COST/KWH) X (24x365); CO2 emission offset: ((CPU TDP in KW x POWER SAVINGS) X PUE) / (1 Metric Ton to KWH conversion); Source of energy prices – US and EU: \$0.155/KWH: <https://www.statista.com/statistics/1267500/eu-monthly-wholesale-electricity-price-country/>; Source of Euro to \$\$ conversion rate: 1 Euro = US \$1.06; <https://www.xe.com/currencyconverter/convert/?Amount=1&From=EUR&To=USD>; Source of KWH to Metric Tons of CO2 emission conversion: 1450 KWH = 1 Metric Ton of CO2 emission; <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results>; PUE Source: 1.5 - <https://www.statista.com/statistics/1229367/data-center-average-annual-pue-worldwide/>

About Intel

Intel (Nasdaq: INTC) is an industry leader, creating world-changing technology that enables global progress and enriches lives. Inspired by Moore's Law, we continuously work to advance the design and manufacturing of semiconductors to help address our customers' greatest challenges. By embedding intelligence in the cloud, network, edge and every kind of computing device, we unleash the potential of data to transform business and society for the better. To learn more about Intel's innovations, go to newsroom.intel.com and intel.com.

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