Unmatched capabilities for a cloud-native 5G Core & RAN

By Alex Quach, VP and GM, Wireline and Core Network Division, Intel

Intel has been on a mission for over a decade to move the world's networks out of fixed-function hardware onto programmable, software-defined platforms—our vision from the beginning was that upgrading a network should happen as easily as you upgrade your smart phone.

And in the core, we've done it—Dell'Oro forecasts over 90% of core networks being virtualized by the end of this year[1]—and nearly all known virtualized network servers run on Intel. As we streamline our work there and focus on virtualizing the RAN, we're also moving communication service providers (CoSPs) across the next technology chasm—cloud-native infrastructure.

Cloud-native design opens significant agility in the network—CoSPs can reconfigure on-the-fly new network services to meet changing market demands. Completing this transition is a crucial step in dealing with the ever-increasing complexity in network service delivery—not just from consumer-based data and service demand, but increasingly, from enterprises needing instant intelligence at the edge of their operations.

Most CoSPs I meet are well into their cloud-native journey. But their progress is being slowed by a range of challenges, including unscalable proprietary solutions, lack of in-house expertise, and an inability to find the right technology partners with interoperable solutions. This is in addition to the ongoing pressure for increasingly lower latency, lower cost of ownership, security and better, more power-efficient network performance.

Intel sponsored an IDC survey of network leaders from over 300 CoSPs to gauge progress, priorities, plans, and challenges with cloud-native projects. Respondents named various motivators for cloud-native projects including, digitization, modern IT infrastructure, flexibility, agility, hybrid/multi-cloud, developer-friendly IT processes, automation, innovation, new service monetization, application portability, and cost reduction.

A significant percentage of network and IT professionals noted challenges across security and visibility, while many look to ecosystem relationships to support this multi-year transition.
- **Security:** 73% of network architects named the combination of security, security policies, and compliance across all environments as top challenges.
- **Full-stack Visibility:** "Visibility over the entire infrastructure" is one of the biggest operational hurdles facing CoSPs according to 73% of network IT pros. It's more difficult to detect and correlate faults across the core, RAN, and edge, leading to longer time-to-resolution of root causes.
- **Ecosystem Collaboration:** Almost half (48%) want greater collaboration and integration, more turnkey solutions, and more support and training from the supply chain.

Taking CoSPs across technology chasms is what Intel and our ecosystem do best—and with cloud-native we're doing it again, fostering better component integration and driving down cost.

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[1] Dell'Oro report published in Jan. 2023, "Mobile Core Network & Multi-Access Edge Computing Quarterly Report" + Intel internal analysis

We start with flexible CPUs built for microservices workloads, and a common, containerized software foundation that simplifies access to advanced hardware capabilities for workload placement, acceleration, and automation. Then, we layer in extensively tested Ethernet controllers and adapters, optimizing workload performance with capabilities like cloud-to-edge high-precision timing synchronization. Increasingly, our new Infrastructure Processing Units (IPUs) are also being added to enable all-new levels of network agility, freeing up CPU cores by accelerating infrastructure functions, including storage, network virtualization and security.

Our ecosystem of over 500 network software and solution providers has driven thousands of real-world implementations and turnkey solutions for cloud-native networks, and they are building it all on top of Intel—the most proven set of network technologies in the world.

Supporting Net Zero without Compromising Performance

The global energy crisis is adding a new level of complexity to the operations of a CoSP. "How can we reduce power consumption across the infrastructure?" I have heard this question more frequently in the last several months when meeting with our customers, partly because the power bill- represents 20-40%[2] of total network operating expenses (OpEx). Energy consumption is also a major contributor to Scope 2 emissions. Verizon estimates that it generates 90%[3] of its operational carbon footprint from the electricity used to power its networks.

On average, the RAN consumes the highest percentage of network power, followed by the wireless core and data centers. Clearly there are enormous opportunities to reduce power consumption across the entire network. Forty-six percent of CoSPs expect energy-efficiency technology to drive OpEx savings CoSPs expect energy-efficient technologies to drive OpEx savings according to a 2022 GSMA report[4].

At the same time CoSPs cannot compromise key performance indicators (KPIs), such as throughput, latency, and packet drop for energy efficiency.

Intel Continues to Innovate with Every Generation

With the launch of 4th Gen Intel Xeon Scalable processors, earlier this year, Intel is breaking ground again on performance leadership, energy consumption reduction in run time, security, and full-stack visibility. Let me briefly highlight these solutions, many of which will be on display at MWC alongside our partners and customers.

Performance Requirements

Performance per watt is ever more important as a top metric in telecommunications. That's why our latest network-optimized 4th Gen Intel Xeon Scalable processors offer industry-leading per-core performance and energy efficiency with the widest array of built-in accelerators helping operators in their transition to cloud-native networks. You can see the gains across key workloads, such as:
- Up to 2X higher throughput capacity in vRAN without increasing power[5]
- Up to 1.88X higher user plane throughput in 5G wireless core[6]

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[2] "Journey Towards Net Zero Mobile Network," Strategy Analytics, February 2022
[3] "Sustainability" Verizon Landing Page
[4] "The Mobile Economy 2022," GSMA, 2022
[5] See [N10] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.
[6] See [N8] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.

- 1.46X more live linear connections for content delivery networks[7]
- Up to 2X better throughput in vCMTS[8]
- 1.71X higher throughput for next gen firewall (SASE)[9]

Run-Time Power Management, Reducing OpEx and Scope 2 Emissions Towards Net Zero

Intel is delivering differentiated power management capabilities that enable CoSPs to significantly lower power consumption, OPEX, TCO, and Scope 2 carbon emissions. Networks transitioning to cloud-native architecture can take advantage of microservices based resource management of network functions to utilize compute resources in the most energy efficient way.

In a video conversation with Intel's Dan Rodriguez to celebrate the launch of the 4th Gen Intel® Xeon® Scalable processors, Telefonica CTO, Enrique Blanco, noted that the company achieved a seven percent reduction in overall power use in the face of a 7X traffic increase over the past six years. Microprocessors made it possible to increase performance and reduce power at the same time.

These new network-optimized processors deliver significantly improved performance per watt and without compromising performance KPIs. For example, Intel® vRAN Boost is now integrated in the latest Intel Xeon processors to eliminate the need for a separate Layer 1 acceleration card, reducing board design and system integration complexity while also further reducing compute power by 20% in cloud-ready vRAN and Open RAN deployments.

In 2022, Intel and partners also showed how software could tap advanced power management and telemetry capabilities in Intel Xeon processors to reduce server power consumption without any negative impact to performance KPIs.

Security

It's understood that cloud native 5G networks have larger attack surfaces, potential vulnerabilities in distributed user and control planes. We're focused on hardware-based solutions to deliver end-to-end security of data at rest, in process and in motion. For example, processor optimizations include crypto acceleration to ensure security and performance are addressed simultaneously. Another example is Intel® Software Guard Extensions (SGX) that uses a small portion of CPU memory to create a secure enclave to protect application code and data from processes running at higher privilege levels (OS, application layers, etc). At MWC Las Vegas late last year, we demonstrated how partners can deliver secure communication between 5G Control Plane network functions with private key management based on Intel SGX and Intel crypto acceleration technologies.

Full-stack visibility

CoSPs need access to the right data at the right time across every layer of the stack and network node, coupled with the ability to make sense of information and recommend targeted action. The combination of 4th Gen Intel Xeon Scalable processors and Intel® Platform Telemetry Insights provides a granular view into the foundation of network infrastructure to track and measure a wide range of operational metrics.

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[7] See [N60] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.
[8] See [N4] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.
[9] See [N24] at intel.com/processorclaims: 4th Gen Intel Xeon Scalable processors. Results may vary.

The industry can benefit from infrastructure observability through Intel's standard implementation of the Open Telemetry project hosted by the Cloud Native Computing Foundation. Our EXFO collaboration is a good example of how Intel's platform telemetry, when fed into an automated service assurance solution, helps accelerate identification and root cause resolution of customer experience degradations originating in the underpinning cloud native infrastructure.

Accelerate Deployments via Ecosystem Collaboration and Training

Intel continues to invest in software solutions, reference architectures, and building a vibrant ecosystem to reduce time to deployment and increase the pace of innovation. Intel FlexRAN™ reference software, supporting 5G mMIMO, sub6GHz, mmWave and LTE, is licensed by over 150 ecosystem partners, who leverage it to deliver commercial 4G and 5G cloud native vRAN solutions.

The Bare Metal Reference Architecture (BMRA) and Key Management Reference Architecture (KMRA) simplify technology integration and help speed up deployments of highly secure cloud native network infrastructures.

Intel's network technologies use a common software foundation optimized for cloud-native architectures. New software solutions are designed to make it easier and faster to consume differentiated hardware features. We deliver commercial solutions with partner/customer validation, ready for more rapid adoption and deployment. We also support ongoing technical education through the Intel® Network Builders University program, including virtual and face-to-face sessions.

Visit Intel and Ecosystem Partners at MWC Barcelona

CoSPs want more collaboration across the ecosystem to tackle major challenges with cloud native. Each of the solutions I outlined earlier is the direct result of ecosystem engagements around real-world requirements.

That's why I encourage you to stay tuned to upcoming announcements and visit Intel in Hall 3, Stand 3E31 to experience the many ways we are delivering breakthrough performance per watt for the 5G core and RAN, and reducing network power consumption.

The products described may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

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.