Solution Brief

Security and SD-WAN Solution Providers, Communications Service Providers, System Integrators

NEXCOM Launches DNA 140 and DNA 141 for Branch Office Compute

The DNA 140 and DNA 141, based on Intel® Atom® x7000RE and x7000C processor series, are designed for cost-efficient cryptography performance. Company tests this performance against other branch office solutions[i]

Branch office universal customer premises equipment (uCPE) and servers are evolving rapidly to meet the shifting demands of a new hybrid workforce. The main uCPE challenge for IT teams is to expand their edge computing power to accommodate more workloads, tightened security, and AI-enabled applications, while keeping the same budget.

As businesses aim to enhance productivity and collaboration, the role of branch office uCPE has grown beyond basic connectivity to become central to digital transformation initiatives.

One of the most significant shifts is the proliferation of software-defined wide-area networks (SD-WAN) and enhanced network security measures. SD-WAN, which enables more efficient and resilient network traffic management across dispersed sites, is becoming a critical requirement as organizations prioritize performance, security, and cost-effectiveness. The need for higher computing power is particularly evident in handling complex traffic management, quality of service optimization, and real-time decision-making.

Network security requirements have also become more sophisticated, especially as the attack surface grows with a distributed workforce and an increase in cloud-based applications.

Branch offices now need network line-speed encryption capabilities for advanced security solutions such as secure access service edge (SASE) gateway, next-generation firewall, and intrusion prevention systems (IPS), all of which demand higher compute resources.

Overall, the evolving role of branch offices as hybrid workspaces is driving a transformation in the underlying infrastructure, with a significant focus on compute performance. The integration of SD-WAN, network security, and emerging AI workloads is pushing the limits of traditional uCPE and compute and network packet-processing requirements.

NEXCOM, an Intel® Partner Alliance Titanium Tier Partner and Intel® Industry Solution Builders member, has developed a new generation of uCPE server that uses Intel® architecture CPUs to deliver a cost-efficient yet performant branch office network appliance.

DNA 140 and DNA 141 Provide Efficient Edge Compute

The DNA 140 and DNA 141 are NEXCOM's latest AI-in-a-box network appliance designed to deliver advanced encryption performance and support edge AI inferencing performance for a wide range of branch office and edge applications.

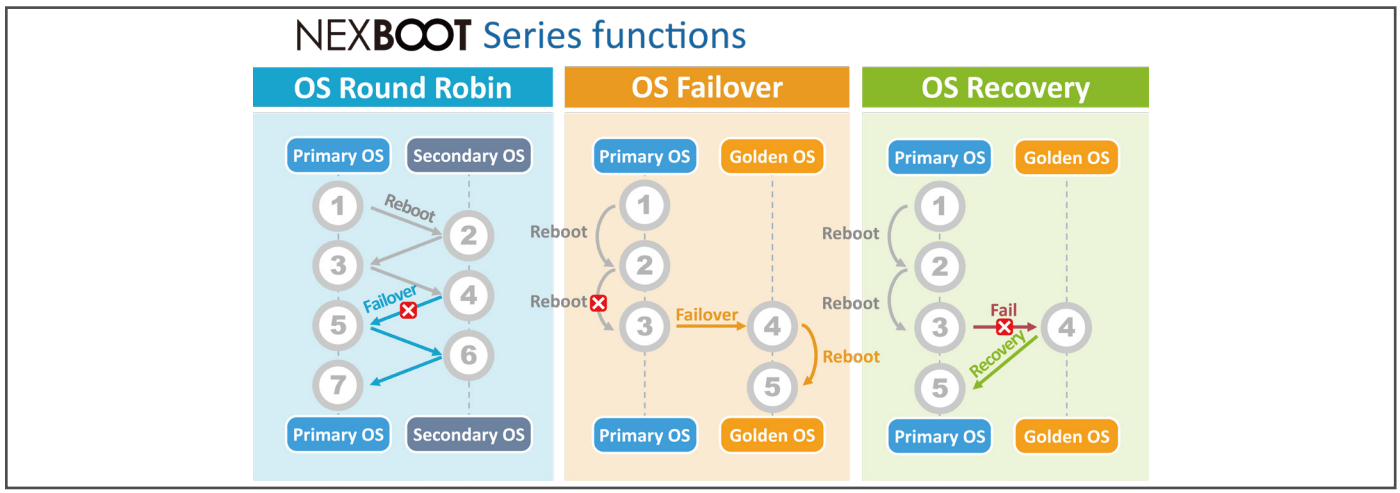

Figure 1. NEXCOM's NEXBOOT functionality creates a Golden OS on a separate storage drive to help the DNA 140 and DNA 141 recover from an OS update failure.

The DNA 140 and DNA 141 are compact yet powerful edge compute appliances, offering a robust foundation for AI-driven applications, fast and secure data transfer, and efficient edge computing.

Their adaptability and feature-rich design make them an ideal choice for integrating 5G, SD-WAN, SASE, and edge computing capabilities into branch offices.

The DNA 140 appliance, when configured with an Intel Atom x7000RE processor, features four 2.5GbE LAN ports. The DNA 140 supports power over Ethernet (PoE) connectivity supporting IoT applications, IP cameras, Wi-Fi access points, and for multi-media or business data transmission.

For LTE/5G support, the systems have two M.2 slots for LTE/5G radio modules for redundancy and failover and two nano SIM slots for carrier connectivity. The systems also feature a mini PCIe 5 slot that can support a Wi-Fi or AI module.

Launching NEXBOOT

The DNA 140 and DNA 141 are the first NEXCOM products to feature NEXCOM's NEXBOOT OS failover mechanism (see Figure 1) that ensures that a device boots successfully in the field even if an OS upgrade fails. This feature will help enterprises or communications service providers (CoSPs) to keep systems up-to-date with frequent security updates while avoiding the costs typically associated with update failures.

NEXBOOT creates a golden OS or secondary OS on a separate storage device allowing the DNA 140 and DNA 141 to recover quickly from unexpected errors through different policies, including OS round robin, OS failover, OS recovery, as well as to provide hardware or software diagnostics.

Branch Office Use Cases

Figure 2 shows how the DNA 140 and DNA 141 can serve in branch office uCPE applications. The device sits between the end points with wired ports for PoE connections to an IP camera and to other networking devices, and Wi-Fi connections to office PCs or laptops or AR/VR/XR systems. The system also hosts cellular radio units (RU) connected to a distributed unit (DU) for a private cellular service.

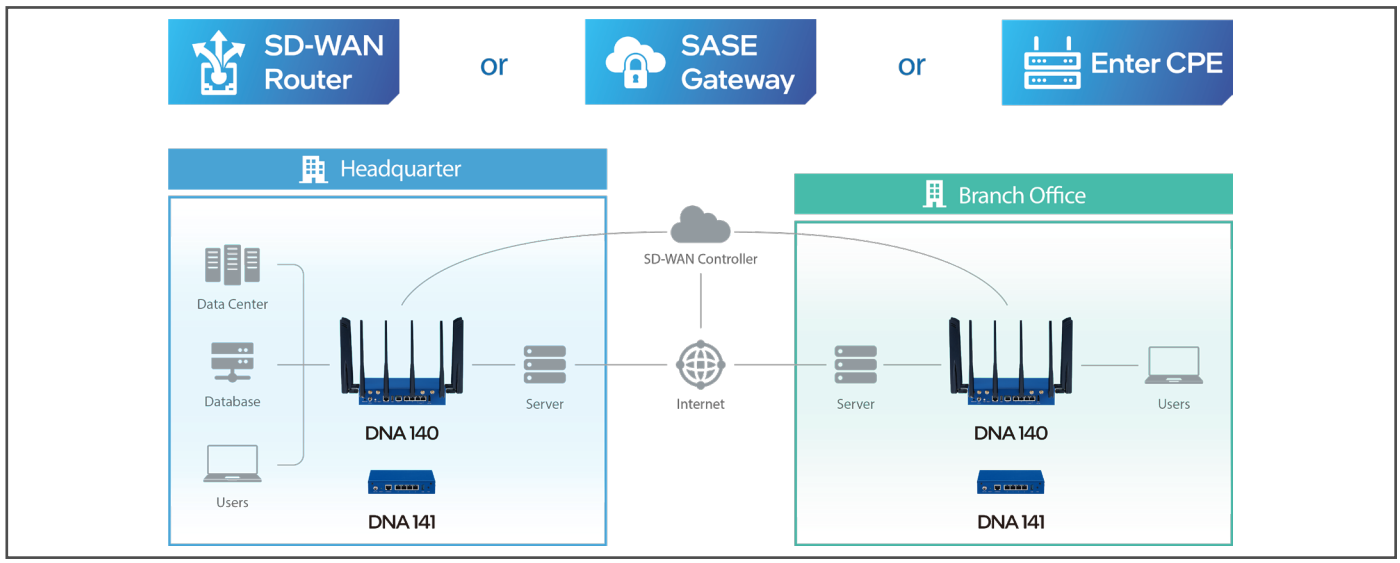

Figure 2. DNA 140 and DNA 141 branch office use case scenarios.

The DNA 140 and DNA 141 can also provide software-defined WAN routing capabilities providing secure access for branch office workers to cloud and data center resources. And lastly, IT managers can layer on security gateway functionality to protect the network and offsite users.

Intel® Atom® x7000RE and x7000C Processor Series

The DNA 140 and DNA 141 receive compute performance from the Intel Atom x7000RE and x7000C processor series that come with up to eight Efficient-cores (E-cores). These power-efficient cores deliver a low TDP of 9W–25W, depending on the model, which supports compact, fanless designs that can be used in space-constrained areas.

And yet, for performance these cores feature Intel® Turbo Boost Technology, which can boost the processor clock speed up to 3.6 GHz (which is the max Turbo frequency).

The devices also support Intel® Ethernet, Wi-Fi, Bluetooth, and 5G connectivity as well as fast LPDDR5 / DDR5 / DDR4 memory to help process more packets for network security workloads.

Some of the crypto acceleration features of these CPUs that made them such a good fit for the DNA 140 and DNA 141 include:

- Intel® Crypto Acceleration is software acceleration of cryptographic workloads using Intel crypto libraries and advanced instruction sets that delivers performance that scales linearly with more CPU cores.
- Intel® Advanced Vector Extensions 2.0 (Intel® AVX2) is an instruction set for Intel architecture CPUs that extends the Intel® Advanced Vector Extensions (Intel® AVX) with 256-bit integer instructions. Intel AVX 2 improves CPU performance for vectorized workloads such as math, codec, image, and digital signal processing software.
- Intel® Multi-Buffer Crypto (Intel® IPsec_mb) for IPsec library, provides software acceleration to primarily targeting encrypted packet processing applications. It simplifies the implementation of multi-buffer processing for authentication and encryption algorithms.
- In-band ECC: Provides memory error-correction code (ECC) without requiring the additional DRAM that is required for out-of-band ECC applications. This frees up board space and reduces power consumption.

Cryptography Performance Tests

To answer the question of whether the low-cost DNA 140 and DNA 141 could provide suitable encryption performance, NEXCOM tested the cryptography performance of the DNA 140 (Config1) in comparison with the NEXCOM DNA 128 (Config 2) which is based on the Intel® Atom® processor C1110 with 2.1 GHz clock speed. (See end note for more configuration details.)

Figure 3 shows how each server was connected to a packet generator which consists of another DNA 128 running TRex 3.04. Each packet generator sends 1,000 flows of packets for 30 seconds tested in multiple iterations. As this traffic reaches the DUT, it implements IPSec encapsulation/de-encapsulation using Vector Packet Processor (VPP) open-source routing software. VPP is accelerated by Intel IPsec_mb, which is installed by default with VPP software.

This test was set up to measure data throughput when VPP encrypted the packets over IPsec and forwarded them at layer 3 to the destination. Each DUT was configured with 5 Gbps of network bandwidth consisting of two 2.5 GbE ports.

These tests were done with large packets (1420 bytes), medium packets (512 bytes) and small packets (64 bytes) to measure performance across the full spectrum of packet sizes.

DNA 140 Delivers

The results of the tests are shown in Table 1 which shows the DNA 140 with a 1.5 GHz processor matching the performance of the DNA 128 with a 2.1 GHz processor at all tested packet sizes.

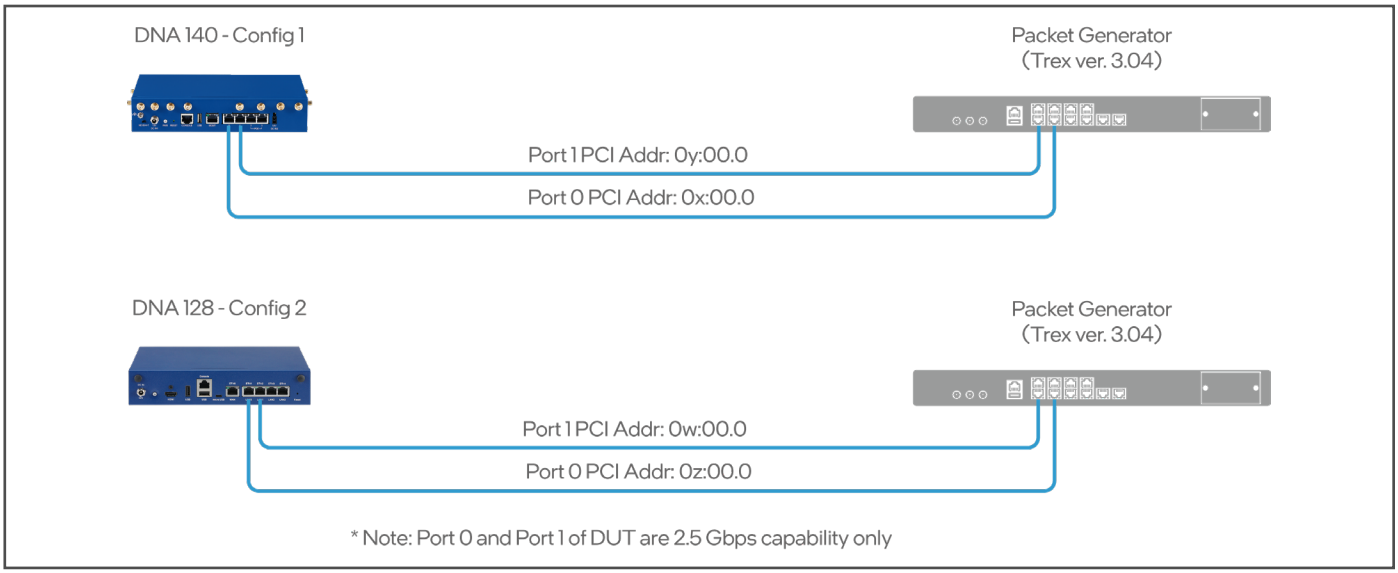

Figure 3. Testbed set up with DUTs on the left and packet generators on the right.

Test Item	DNA 128 (config 2) Intel® Atom® C1110	DNA 140 (config 1) Intel® Atom® x7433RE	
Test Item	No Turbo boost	Turbo boost: OFF	Turbo boost: ON
CPU core freq.	2.1 GHz	1.5 GHz	2.2 GHz
VPP IPsec throughput (Gbps) AES128-GCM with 1420B packets	9.82	8.92	9.86
VPP IPsec throughput (Gbps) AES128-GCM with 512B packets	6.42	5.32	8.06
VPP IPsec throughput (Gbps) AES128-GCM with 64B packets	2.91	2.06	3.29

Table 1. VPP IPsec test results for DNA 140 (Intel® Atom® x7433RE processor) and DNA 128 Intel® Atom® processor C1110) .

With both large and medium packet sizes, both servers provide near line rate packet-per-second (PPS) performance on both 2.5GbE connections. As expected, PPS throughput drops for small packet sizes. The DNA 140 DUT delivered higher performance with Intel® Turbo Boost Technology enabled.

Conclusion

The need for branch office compute performance is growing with expanded use of SD-WAN, cryptography, AI and other applications. With its new DNA 140 and DNA 141 network appliances, NEXCOM has developed a solution designed for this environment. The DNA 140 and DNA 141 are based on the cost-effective yet powerful and low energy Intel Atom x7000RE and x7000C processor series. As seen in tests conducted by Intel and NEXCOM this new network appliance delivers optimal performance for the edge use cases with security

Learn More

NEXCOM DNA 140

NEXCOM DNA 141

Intel® Atom® x7000RE and x7000C processor series

Intel® Atom® processor C1110

Intel® Industry Solution Builders

[i] Config 1: 1-node, 1x Intel Atom® x7433RE processor with 4 cores. Total DDR5 memory was 16 GB (1 slots/ 16GB/ 4800 MHz); microcode 0x17; Intel® Hyper-Threading Technology - disabled; Intel® Turbo Boost Technology - enabled. BIOS version: Intel FSP: OC.02.89.40. Application storage is M.2 2242 SATAIII (64GB); Network controller: 2X Intel® Ethernet Controller I226-V(up to 2.5GbE). Software: OS was Ubuntu 22.04.4 LTS; kernel was Linux 5.15.0-112-generic. Benchmark/workload software: VPP*24.02; Compiler was GCC 11.4.0; Libraries were IPsec mb-v.15, DPDK*23.11, and DPDK – cryptodev: aesni mb PMD. Other software: ICE driver 1.11.14, iavf driver 3.2.3-k and ICE firmware 4.10., Trex v3.04, NIC driver: Igc v.5.15.0-113-generic. Test conducted by NEXCOM and Intel on July 17, 2024.

Config2: 1-node, 1x Intel Atom® processor C1110 with 4 Efficient-cores. Total DDR5 memory was 8 GB (1 slots/ 8 GB/ 5200 MHz); microcode 0x7; Intel® Hyper-Threading Technology - disabled; Intel® Turbo Boost Technology - disabled. BIOS version: Intel FSP: OC.02.89.40. Application storage is UFS v2.1 (64GB); Network controller: 2X Intel® Ethernet Controller I226-V (up to 2.5GbE). Software: OS was Ubuntu 22.04.4 LTS; kernel was Linux 5.15.0-112-generic. Benchmark/workload software: VPP*24.02; Compiler was GCC 11.4.0; Libraries were IPsec mb-v.15, DPDK*23.11, and DPDK – cryptodev: aesni mb PMD. Other software: ICE driver 1.11.14, iavf driver 3.2.3-k and ICE firmware 4.10., Trex v3.04, NIC driver: Igc v.5.15.0-113-generic. Test conducted by NEXCOM and Intel on July 17, 2024.

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