



Technology Brief
Intel® I/O Acceleration Technology
IT Data Centers

Remove I/O Bottlenecks to Improve Data Center Performance

Intel® I/O Acceleration Technology moves data more efficiently through Intel® Xeon® processor-based servers for fast, scaleable, and reliable network performance.

Intel® I/O Acceleration Technology (Intel® I/OAT) improves network application responsiveness by unleashing the power of Intel® Xeon® processors through more efficient network data movement and reduced system overhead. Network acceleration from Intel I/OAT scales seamlessly across multiple Gigabit Ethernet (GbE) ports.

Because it is tightly integrated into popular operating systems, Intel I/OAT is a safe and flexible choice, avoiding the support risks from new network stacks and preserving existing networking requirements such as teaming and failover.

Key Benefits for IT Data Centers

- **Performance.** A primary benefit of Intel I/OAT is its ability to significantly reduce CPU overhead, freeing resources for more critical tasks. Intel I/OAT uses the server's processors more efficiently by leveraging architectural improvements within the CPU, chipset, network controller, and firmware to minimize performance-limiting bottlenecks.

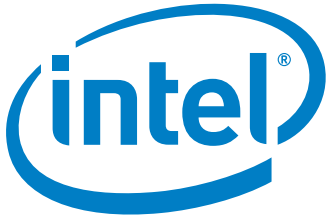
Intel I/OAT accelerates TCP/IP processing, delivers data-movement efficiencies across the entire server platform, and minimizes system overhead.

- **Scalability.** Intel I/OAT provides network acceleration that scales seamlessly across multiple GbE ports. It cost-effectively scales up to eight GbE ports and up to 10GbE, with power and thermal characteristics similar to those of a standard gigabit network adapter.

TCP Offload Engine (TOE) solutions, in contrast, require a separate TOE card for each port, resulting in significant cost and thermal challenges for server platforms.

- **Reliability.** Intel I/OAT is a safe and flexible choice because it is tightly integrated into popular operating systems (OSs) such as Microsoft Windows Server* 2003 and Linux*, avoiding support risks associated with relying on third-party hardware vendors for network stack updates. Intel I/OAT also preserves critical network configurations such as teaming and failover, by maintaining control of the network stack processing within the CPU—where it belongs. This results in reduced support risks for IT departments.

In contrast, TOE offloads processing of the OS network stack to a network adapter, which requires customized support by a third-party software vendor to maintain network configurations.



Delivering Advantages in an Alternative to TOE

These benefits of Intel I/OAT are tremendously valuable to enterprises seeking alternatives to TOE technology in managing communication-overhead processing tasks.

TOE solutions place packet-processing logic in the network adapter. This logic then performs some of the packet processing, thereby offloading it from the principal system processor(s). Intel I/OAT overcomes several important TOE drawbacks:

- **Intel I/OAT is a complete, system-wide solution.** TOE only addresses a portion of the problem, because it focuses on TCP processing, and the offloading of this processing from the CPU, where it belongs, to the network adapter. Intel I/OAT addresses packet and payload processing bottlenecks throughout the server platform, including the CPU, chipset, Ethernet controller, and network stack.
- **Intel I/OAT requires no system modification.** TOE requires all software that touches packets downstream to be modified to accept the TOE output. Moreover, this lack of conformity with system network data processing expectations means that TOE interferes with crucial functions such as teaming multiple ports and correctly handling port-to-port failover. Intel I/OAT maintains TCP/IP processing within the CPU, thus protecting key network configurations without requiring any modification of existing or future applications.
- **Intel I/OAT uses a consistent approach.** When the data volume on a TOE adapter exceeds TOE's ability to handle it, the excess packets are simply routed to the CPU using the traditional network stack. For these packets, TOE confers no advantage.

- **Intel I/OAT provides superior scalability.** TOE solutions are optimized for a single network port and are dependent on a fixed-speed microcontroller. They cannot leverage more or faster processors, faster memory, nor are they easily scalable across multiple GbE ports. Intel I/OAT, on the other hand, supports all of these capabilities while maintaining the same thermal, power, and cost requirements of a standard Ethernet controller.

Another inherent challenge to using TOE is that various TOE vendors offload packet processing differently. This factor makes it very difficult for system administrators to support enterprise-wide TOE, as each server may have differing needs depending on which TOE adapter it uses and the data volume passing across it.

Moreover, unlike Intel I/OAT, which is integrated with the OS's network processing stack, TOE adapters must be obtained from the TOE chip manufacturer and then integrated with specific implementations. This makes upgrades to the OS far more difficult, because TOE customers must wait for the chip vendor to release new versions of the drivers. Intel I/OAT isn't dependent on third-party suppliers for support.

Looking Forward

Intel I/OAT increases CPU efficiency and maximizes data throughput. Because it is a true platform technology that leverages key enhancements to the CPU, chipset, and LAN, it derives benefit from future platform improvements. Continuing advances to platform components such as the processor, chipset, memory, and I/O devices provide a path for future performance gains.

For more information, visit:

www.intel.com/technology/ioacceleration/