

# Intel® Application Security and Delivery Acceleration Kit

The Intel® Application Security and Delivery Acceleration Kit makes it easy to develop a secure solution for high-performance application delivery on Intel® Tofino™ Expandable Architecture

## Solution Benefits

Benefits of using the Intel® Application Security and Delivery Acceleration Kit include:

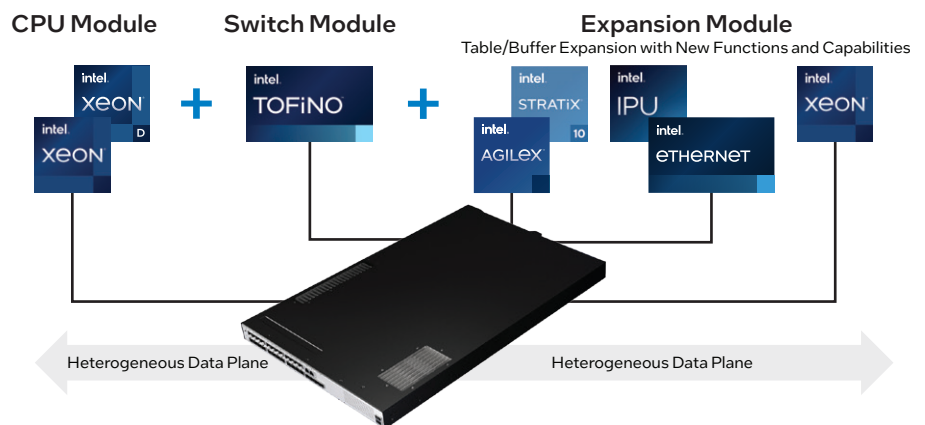
- Off-the-shelf implementation or customizable to meet network specifications
- Faster time to deployment
- Reduced development complexity of secure, reliable and fast application delivery solution
- Reduced total cost of ownership of the developed solution

## Executive Summary

The total amount of data created, captured, copied and consumed globally is forecasted to nearly triple from 64.2 zettabytes (ZB) in 2020 to 180 ZB in 2025.<sup>1</sup> This rapid growth in demand—driven by high-bandwidth applications such as 4k video, teleconferencing and artificial intelligence/machine learning (AI/ML)—is straining existing network infrastructures. Providing unlimited internet access for this growing and diverse portfolio of applications requires excessive network heterogeneity that can make hostile traffic difficult to detect. As internet traffic loads continue to increase, service providers need a fast and easy-to-implement solution to efficiently deliver terabits of application traffic to the right servers while helping to provide an effective means of security and protection against attacks.

The Intel® Application Security and Delivery Acceleration Kit provides all the software components necessary to implement a fully operational solution for application security and delivery. This Intel® Tofino™ Expandable Architecture Platform Acceleration Kit leverages the power of Intel® Tofino™ Expandable Architecture and the acceleration capabilities of Intel® FPGAs and/or Intel® Infrastructure Processing Units (Intel® IPU) to extend and augment Intel® Tofino™ Intelligent Fabric Processor (Intel® Tofino™ IFP) functionality for application security and delivery solutions that are fast, more secure and reliable (see Figure 1).

## Intel® Tofino™ Expandable Architecture



**Figure 1.** Intel® Tofino™ Expandable Architecture combines CPUs, IFPs, and FPGAs and/or IPUs into a single rack-mount system.

## Business Challenge

In today's rapidly expanding and resource-consuming networks, network loads from many customers must be distributed quickly to deliver the correct content while also helping to protect against the growing number of threats and attacks. This requires significant processing power due to repetitive packet processing operations that need to happen at high speeds reaching terabits-per-second (Tbps) of network traffic.

Until now, the most commonly available solutions were either appliance-based or software-based. Appliance-based systems provide static and proprietary solutions designed for specific, limited purposes; but these legacy solutions create vendor lock-in by both limiting vendor options and reducing the ability to quickly modify the solution to meet changing needs. Software solutions are very flexible, easy to deploy and inexpensive to run on commodity servers. However, scaling a software implementation to the Tbps speeds can lead to a much higher total cost of ownership (TCO).

## Solution Value

The goal of using the Intel® Application Security and Delivery Acceleration Kit is to accelerate the development of a customer-owned solution for high-speed and more secure network load distribution. The Intel Application Security and Delivery Acceleration Kit is a software framework containing reference implementations of key data plane functions that can be used as is or further modified and extended by the customer to meet specific network requirements.

## Solution Architecture

The Intel Application Security and Delivery Acceleration Kit is an extension of the Intel® P4 Studio Software Development Environment (Intel® P4 Studio SDE) and consists of reference implementation of three major functions that are combined for efficient acceleration of application security and delivery:

- Intel® Tofino™ Intelligent Fabric Processor (Intel® Tofino™ IFP) P4 reference profile including:
  - Hardened L2/L3 switching and routing functions.
  - Layer 4 server load balancing with an extremely fast session table running at the speed of the Intel Tofino IFP.
  - Distributed Denial of Service (DDoS) detection and mitigation capabilities for TCP SYN flood (check the Learn More section for additional reading material).
- Intel® FPGA implementation of the extra-large lookup table for an extremely large session table supporting up to hundreds of millions of sessions.
- Control plane software for managing and controlling execution of the Intel Tofino IFP and Intel FPGA data plane.

## Features

Features of the Intel Application Security and Delivery Acceleration Kit include the following:

- **Speed:** Draws on the processing power of Intel® Tofino™ Expandable Architecture to significantly increase memory resources for scalable solutions such as stateful load balancing that can handle multi-terabit speeds and 100s of millions of concurrent users.
- **Software programmability:** Offers easy customization to address evolving requirements and deployment scenarios, providing the flexibility to change and grow with customer needs. The ability to make changes after deployment helps protect network infrastructure investment.
- **Time to market:** Includes pre-integrated data plane functionality and features for quick development and deployment of new solutions.

## Functionality

### Hardened and Customizable L2/L3 Switching and Routing

The hardened switch profile can save both time and engineering resources, and thanks to support for industry-standard SAI API, it's possible to leverage broad community work, as well as existing projects (e.g., SONiC OS) and tools.

### Server Load Balancing with Extra-Large Tables

L4 load balancing is a network service responsible for the distribution of network traffic. It operates at a transport layer OSI model, and its role is to decide where every packet gets forwarded. This decision can be stateless or stateful.

**Stateless load balancing** is typically straightforward to implement and does not require memory resources, but it is less resistant to changes in the network, such as when a new server becomes available. It can be difficult to change the load balancing algorithm to add the server into the pool of destinations without disrupting the existing flows.

**Stateful load balancing** is a more robust and flexible approach, but it requires large memory allocations. These memory requirements become even more limiting if stateful load balancing gets implemented in the data center switch. To address that, the Intel Application Security and Delivery Acceleration Kit offers the capability to leverage the power of Intel Tofino Expandable Architecture to significantly increase the memory resources and provide scalable stateful load balancing. Because it can handle multi-terabit speeds and 100s of millions of concurrent users, this solution can reduce TCO by more than 10x compared to traditional load balancing solutions.<sup>2</sup>

## Tiered Cache Hierarchy

The Intel Application Security and Delivery Acceleration Kit leverages a tiered cache hierarchy of Intel Tofino Expandable Architecture where extremely fast lookup memories available in Intel Tofino IFP are complemented by large memory resources of expansion modules.

## TCP SYN Flood DDoS Protection

By monitoring the rate of SYN requests, the solution is able to detect anomalous situations and trigger a defense mechanism that leverages the SYN proxy algorithm to challenge and authenticate the source of the communication.

## Applications

Secure Access Service Edge (SASE) is another cloud-delivered service application that benefits from the efficient implementation of operations provided by the Intel Application Security and Delivery Acceleration Kit to build server load balancing, network address translation (NAT) and security functions like DDoS detection and mitigation.

## Conclusion

Network infrastructure must continue to evolve to meet the growing demand for high-speed, high-bandwidth applications while providing fast, more secure and reliable application delivery. The Intel Application Security and Delivery Acceleration Kit provides all the necessary software components for quick and easy implementation of reliable and efficient network traffic delivery solutions while protecting against attacks, reducing development complexity, accelerating time to deployment and lowering TCO. The Intel Application Security and Delivery Acceleration Kit is available for Intel Tofino Expandable Architecture platforms.

## Learn More

You may find the following resources helpful:

- [Intel® Tofino™ Expandable Architecture White Paper](#)
- [Intel® Application Security and Delivery Acceleration Kit Product Brief](#)
- [SYN flood](#)

Find the solution that is right for your organization. Contact your Intel representative or visit [intel.com/fabric](https://intel.com/fabric).



<sup>1</sup> Statista, "Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2020, with forecasts from 2021 to 2025."

<sup>2</sup> Testing by iQiYi as of March 2022. 10x total cost of ownership (TCO) improvement justification: Performance report for software-based load balancing at GitHub – iqiYi/dpvs: DPVS is a high-performance Layer-4 load balancer based on DPDK. This report demonstrates performance of around 2.5M packets per second (pps) per core. 3rd Generation Intel® Xeon® Scalable processors offer up to 40 cores per processor. A dual-socket server can thus achieve 2 processors x 40 cores/processor x 2.5M pps/core = 200M pps. A server switch (containing two 3rd Gen Intel Xeon Scalable processors, an Intel® Tofino™ programmable Ethernet switch ASIC, and an Intel® Stratix® 10 FPGA) can deliver up to 4.8B pps, so it is possible to achieve the same or better packet forwarding capacity of 20 dual-core servers using a single server switch. The freed-up servers can be used for revenue-generating workloads instead of being part of infrastructure cost, further improving TCO of the data center.

Performance varies by use, configuration and other factors. Learn more at [intel.com/PerformanceIndex](https://intel.com/PerformanceIndex). Performance results are based on testing by Intel and may not reflect all publicly available security updates. See configuration disclosures for details. No product or component can be absolutely secure. Your costs and results may vary. Intel technologies may require enabled hardware, software, or service activation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others. © Intel Corporation 1222/TKOE/KC/PDF 751815