Lanner

White Paper

Accelerating Ethernet Performance and Throughput with Intel® DPDK

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Overview

Enterprise and industrial network management have been undergoing from a hardware-concentrated approach to a more agile, flexible and consolidating solution for the rapid growing challenges in ownership cost due to the rising workload by cloud computing and information security. Traditionally, companies invested large amount of capital in discrete, physical machines to meet the workload demand, but nowadays, with the unprecedented growth in the amount of network traffic, it is more practical to rely on software approaches to balance workload and cost, while improving packet processing performance on a single platform. This is made possible by Intel DPDK (Data Plane Development Kit), as long as the platforms are built with Intel processors.

Fundamentals and Characteristics

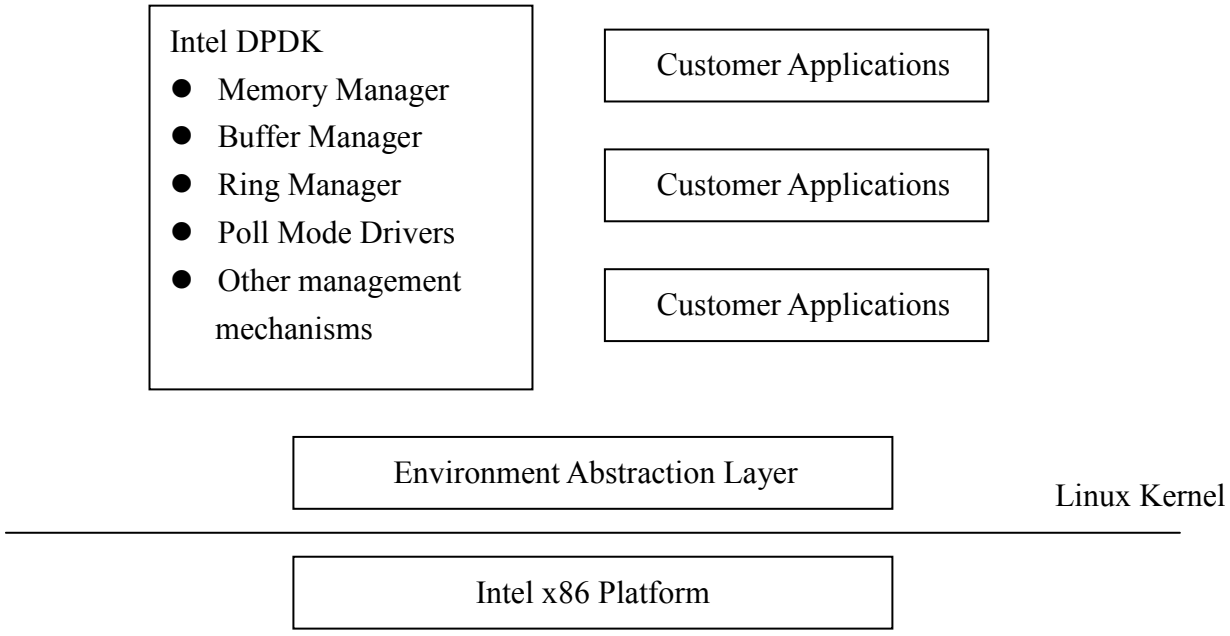
Intel® DPDK is a software set of libraries and Ethernet drivers compatible on any Intel x86 processors for accelerated packet processing. It is designed to run in Linux environment for enterprise and industrial network management. The libraries of Intel DPDK improve data plane performance, pre-fetch data, trim memory latency down and reduce development time so that enterprises can save tremendous cost in vertically-integrated and monolithic hardware such as evolved packet cores. On the other hands, with software assistance, the platform can be easily scalable and more flexible since packet processing and other workloads are executed on Intel processors and DPDK. This indeed will help businesses move to SDN (Software Defined Network) and NFV (Network Function Virtualizations) without excessive ownership cost and development time.

Intel DPDK consists of the following characteristics*:

- The software is implemented to run to “completion model” or “pipeline model”.
- There is no scheduler – all by poll modes without interrupts
- Available from Intel Atom to Intel Xeon multi-core processors or even single core processor with Hyper Threading technology (to be discussed in details later in this paper)
- No restriction to the number of processors and cores
- Optimize DRAM efficiency by equally spreading packets across channels

The characteristics above provide ideal software architecture to address the challenges when large numbers of packets slow Linux Kernel down.
As discussed earlier, Intel DPDK is a set of software libraries and drivers operating in Linux user space to accelerate packet processing capabilities. This performance-boosting software architecture includes the following libraries*:

- **Environment Abstraction Layer (EAL)**: an abstracted interface with multi-process and multi-thread supports. It handles DPDK boot and initialization.
- **Memory Manager (librte_malloc):** allocates memories created from huge pages, also known as "pool". This is highly effective when allocating large number of pools of objects in Linux user space. Besides, it also provides alignment so that objects are equally allocated on all DRAM channels.
- **Buffer Manager (librte_mbuf):** this library efficiently helps the operating system to create and terminate buffers, such as message buffers. These message buffers are stored in DPDK memory pools.
- **Ring Manager (librte_ring):** this library uses lockless multi-producer, multi-consumer FIFO queue management. It supports bulk operations and easier to implement.
- **Poll Mode Drivers:** Intel DPDK includes Poll Mode Drivers for 1 GbE, 10 GbE and 40 GbE Ethernet controllers designed to work without asynchronous, interrupt-based signaling mechanism. This will speed up the packet flow.



Intel DPDK Application Diagram*

*Contents are referenced from Intel publically released documents. Please see "Sources and References" for details.

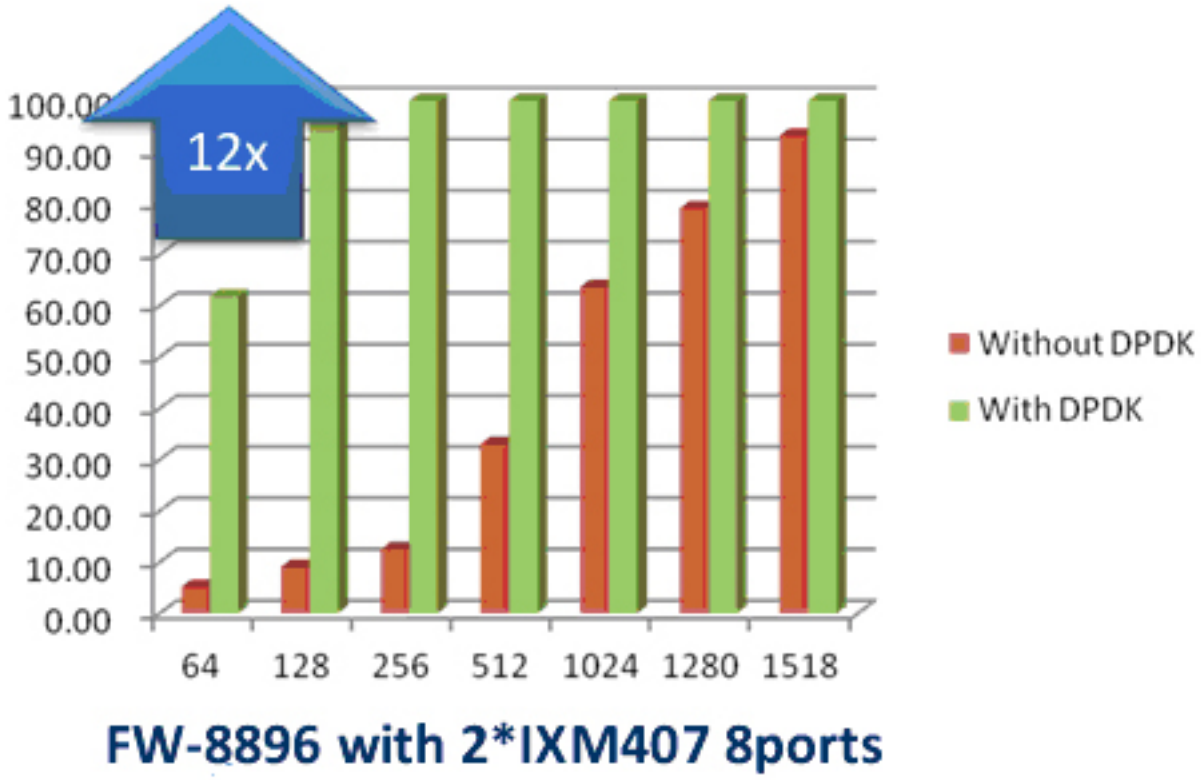
Lanner and Intel DPDK

All Lanner's Intel® x86-based network computing appliances are fully compatible with Intel DPDK, as long as the processor is built in multi-core. Intel DPDK may also work on Lanner network appliances with single-core Intel CPU if the processor is designed with Hyper Threading technology.

In addition, to meet the rising challenges in network workload, including, packet processing, traffic control, and cyber security, Lanner also adopts the latest Intel® XL710 Ethernet controlled (codenamed Fortville). The new Intel® Ethernet XL710 revolutionizes virtualization technology by extending networking capability up to 40GbE. This upgrade delivers hardware optimization, network provisioning, and integrates advanced traffic steering capabilities with Data Plane Development Kit (DPDK) optimized enabling higher packet processing for network appliances in applications like firewalls and load balancers.

Empowered by Intel® Ethernet Controller XL710, Lanner comes up with two network modules: NCS2-IQM201 and NCS2-IXM407. Both are 40GbE capable and utilize PCI Express 3.0 x 8 gold fingers for connection with the system motherboard. Along with Intel DPDK, the Ethernet performance of the network modules are accelerated by multiples.

Figure 1 - Performance Upgrade by DPDK on Lanner's FW-8896 and FW-8877 with NIC module NCS2-IXM407



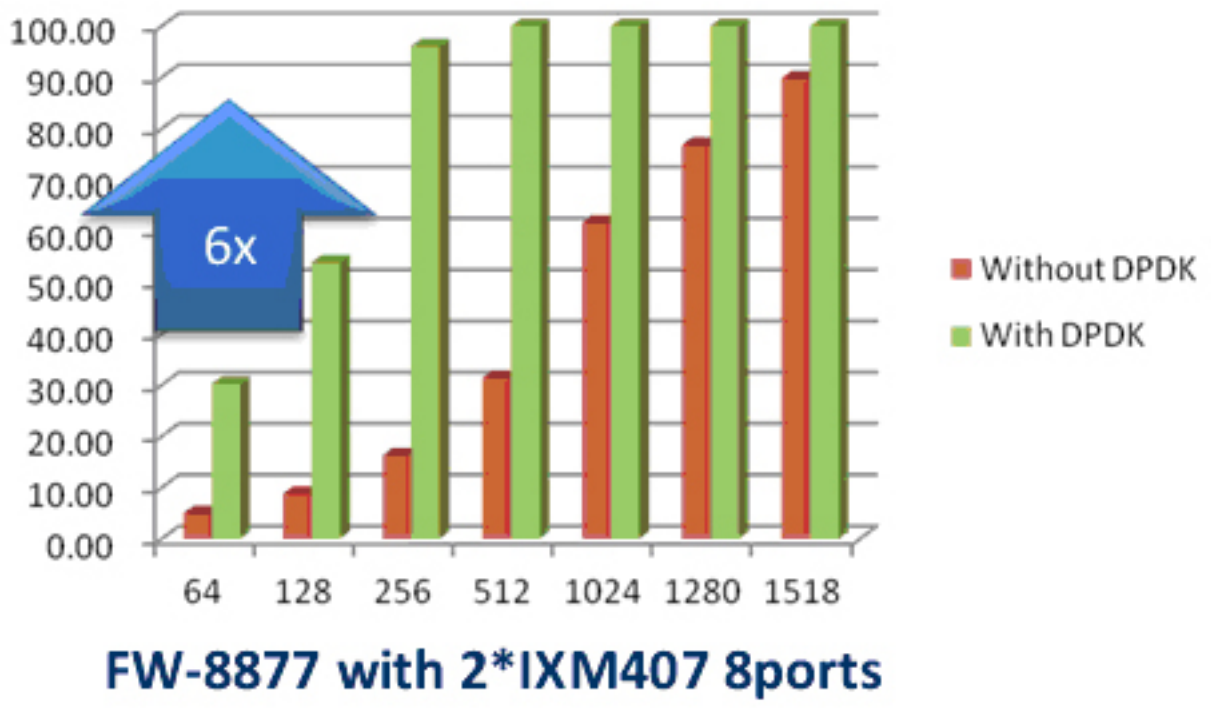
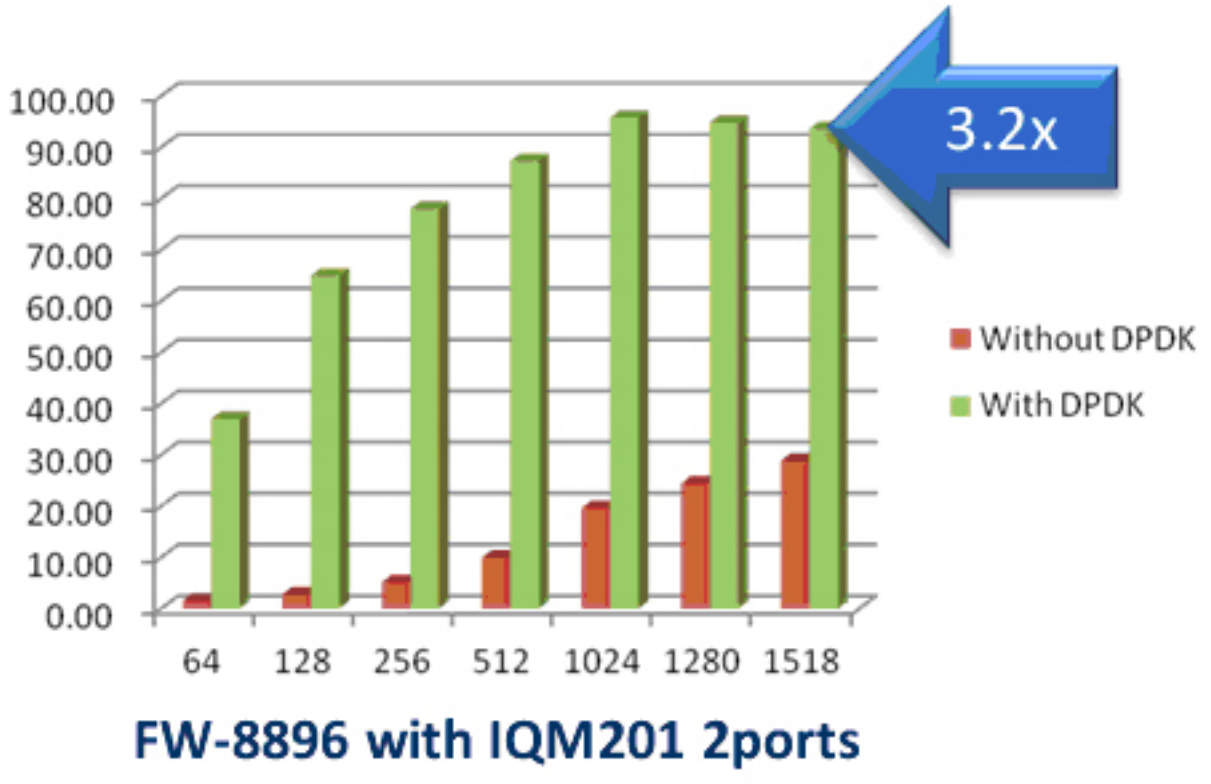
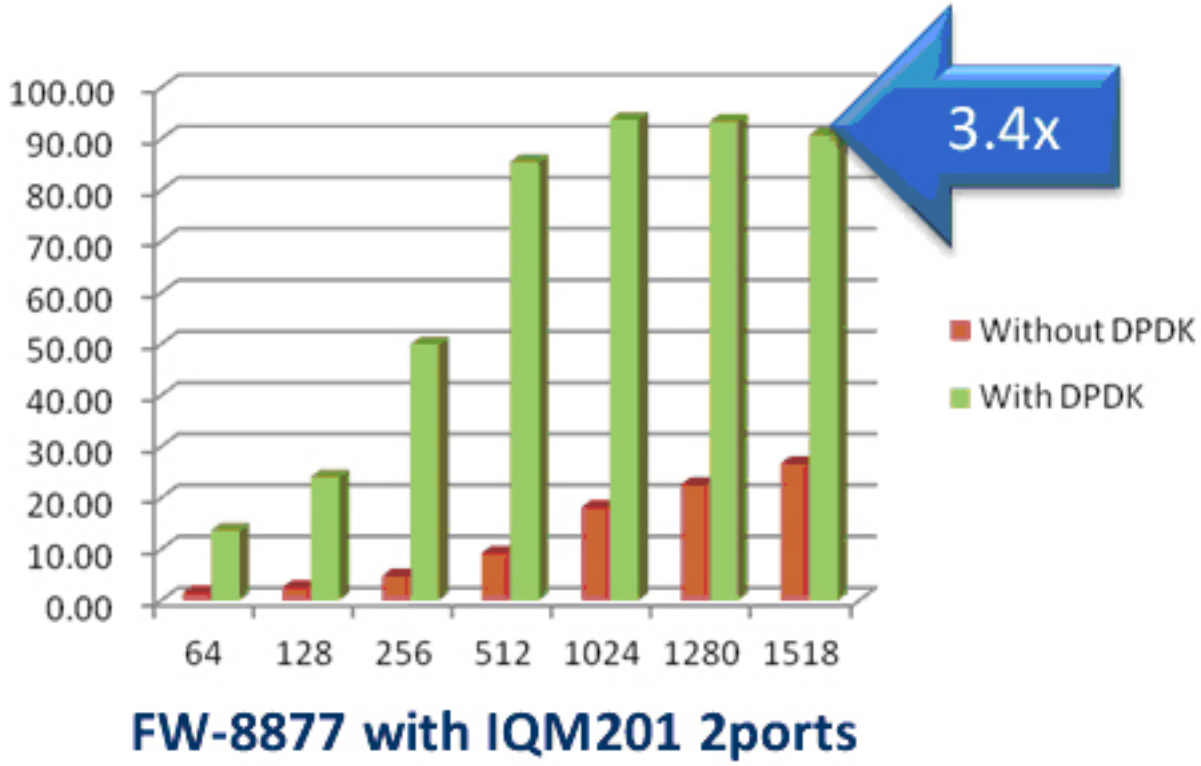


Figure 2 - Performance Upgrade by DPDK on Lanner's FW-8896 and FW-8877 with NIC module NCS2-IQM201



[1]Intel does not control or audit the design or implementation of third party benchmark data or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmark data are reported and confirm whether the referenced benchmark data are accurate and reflect performance of systems available for purchase.
[2]Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Results may vary depending on the operating environments. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.



FW-8877 with IQM201 2ports

For detailed benchmark test results, please contact Lanner representatives.

[3]Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

About Lanner Electronics Inc.

Founded in 1986 and publicly listed (TAIEX 6245) since 2003, Lanner Electronics, Inc. is an ISO 9001 certified designer and manufacturer of network application platforms, network video platforms and applied computing hardware for first-tier companies. Lanner's expertise also extends to include driver and firmware support, enabling customers to optimize hardware and software communication to achieve faster time to market. With headquarters in Taipei, Taiwan and branches in the U.S. and China, Lanner is uniquely positioned to deliver custom technical solutions with localized, value-added service.

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Revision History

Rev	Date (Y/M/D)	Descriptions
1.0	2012/10/24	Official release
2.0	2015/09/01	New platforms in the test New diagrams and figures New products introduced