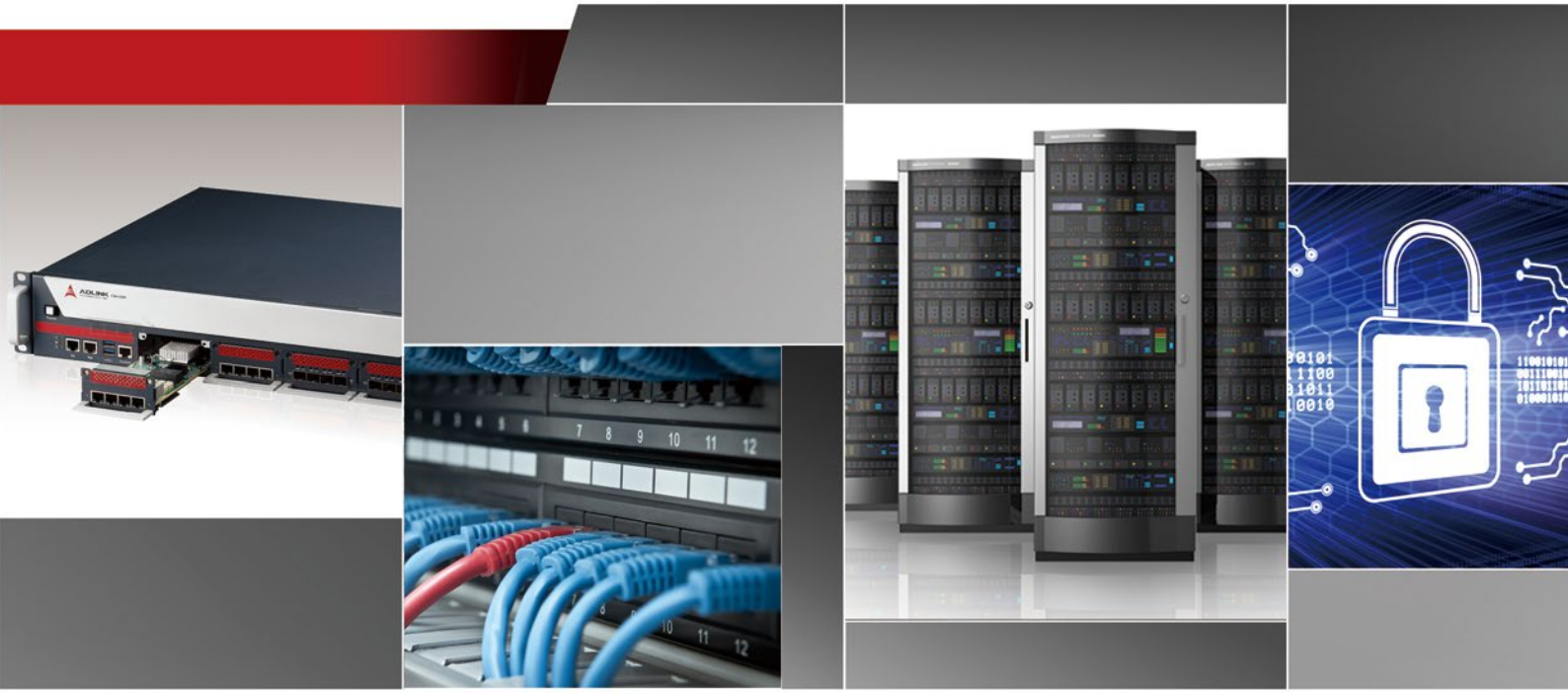
White Paper

Throughput and DPI Enhancements for Network Appliances Using ADLINK PacketManager



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Contents

A Network Appliance for SMEs 3

CSA-5100/5200 Overview 4

Applications 5

- Secure Communications
- Efficient Network Policy Management
- Deep Packet Inspection at All Layers
- Optimized Load Balancing

ADLINK PacketManager Benefits 8

- PacketManager Overview
- Control Plane Software
- Data Plane Software
- Features
- Applications
- Fast Application Development using ARiP
- FastPath for Quick Packet Processing
- Accelerated Content Inspection using RegEx
- Flow-based Load Balancing Performance

Conclusion 10

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A Network Appliance for SMEs

In recent years, small and medium-sized enterprises (SMEs) are experiencing a greater demand for network communications as their data volumes increase due to changes in business Internet usage. For example, according to Cisco's Visual Networking Index (VNI), business IP traffic will grow at a CAGR of 18 percent from 2013 to 2018. This is due in large part to increased adoption of advanced video communications in the enterprise segment, which will cause business IP traffic to grow by a factor of two between 2013 and 2018. In addition, the Internet of Things (IoT), in which practically every device is connected to the Internet and each other, shows threefold growth from 2.3 billion in 2013 to 7.3 billion by 2018 . However, this growth brings with it a number of challenges, including data management, load balancing, and security.

In order for SMEs to serve their customers with efficiency, security, and cost-effectiveness, they need a network communications infrastructure that provides a high data handling efficiency and security, while at the same time maintaining a low capital and operating expenditure (CAPEX and OPEX). Before deploying a network infrastructure, SMEs must carefully evaluate available products to make sure they are suitable for their growing data needs, as well as fit into their IT budget. In addition, SMEs must ensure that the vendor they select can provide the necessary technical support and timely upgrades for their chosen network communications solution.

To meet the needs of SMEs, ADLINK has developed the CSA-5100/5200, a high-performance, low-cost, and easy-to-deploy Network Appliance that provides security, load balancing, and data management with Next-Generation Firewall capability to provide optimal protection against viruses and malicious code from infecting the network. Furthermore, Universal Threat Management (UTM) services such as Deep Packet. Inspection (DPI), VPN gateways, intrusion detection and prevention systems (IDPS), antivirus, anti-spam, and web filtering are enabled to ensure that the networks is secure.

In addition, the CSA-5100/5200's Policy Controller facilitates policy management on the network that effectively manages flow control. Along with this, the Next Generation Operation Support System (OSS) allows SMEs to measure, manage, and monetize broadband usage. Load Balancing features allow SMEs to improve server utilization, maximize availability, and optimize network redundancy.

This White Paper offers an overview of the business benefits and technical features of the ADLINK CSA-5100/5200 Network Appliance.

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1. Cisco Visual Networking Index: Forecast and Methodology, 2013-2018, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html

2. The Zettabyte Era—Trends and Analysis, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/VNI_Hyperconnectivity_WP.html

CSA-5100/5200 Overview

CSA-5100/5200 is a 1U/2U Rackmount Network Appliance based on the Intel® Xeon® processor E3 1200 v3 platform. It is specifically developed to enable Unified Threat Management (UTM), Next Generation Firewall (NGFW), Deep Packet Inspection (DPI), and network security applications for deployment by SMEs in their branch offices or the network edge.

For SMEs, the CSA-5100/5200 Network Appliance offers

- Low cost-performance ratio: 50% CAPEX reduction comes from increased IP traffic handling capability.
- Application-ready platform options: Faster customer application development and reduced time-to-market (TTM) when integrated with ADLINK PacketManager.
- Flexible and compact design: 1U/2U rackmount design with modular I/O architecture to meet a wide range of application needs.

Key technical specifications include

- Intel® Xeon® processor E3, 4th Gen Intel® Core™ i5/i3, Pentium®, Celeron® processors with Intel® C226 Chipset
- High scalability with four Network Interface Module (NIM) slots
- Up to 32x GbE/SFP ports or 8x SFP+
- Flexible storage options: SATA drives, mSATA SSD, SATADOM, CFast
- Automatic LAN bypass function to maintain network connectivity in case of system failure
- Availability as an ADLINK ARiP (Application Ready Intelligent Platform) complete with ADLINK PacketManager for network communications applications



CSA-5100



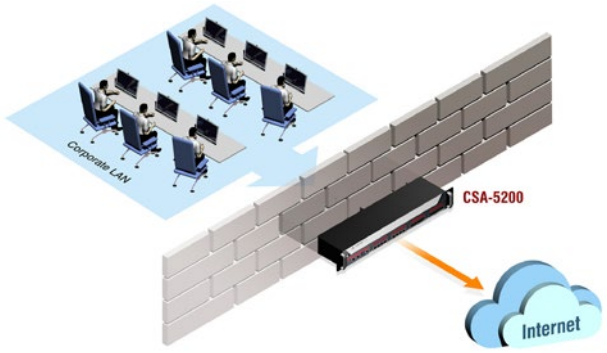
CSA-5200

Applications

Secure Communications

Data security is a primary concern for enterprises of all sizes – from SOHOs (Small Office Home Office) to large corporations. Ensure the security of employee and customer data is of utmost importance. Data Loss Prevention (DLP) services are designed to detect and prevent potential security breaches by monitoring, detecting and blocking unauthorized transfer of sensitive data. DLP solutions require significant processing power which is provided by the CSA-5100/5200 Networking Appliance.

To ensure network security, the CSA-5100/5200 enables the smooth implementation of a Next-Generation Firewall (NGFW) and Universal Threat Management (UTM) solution, which may include a VPN gateway to secure communications with remote users, and/or an Intrusion Detection/Prevention System (IDS/IPS) to handle network threats by monitoring network flows. Antivirus and anti-spam filters ensure that all communication within the network is free of malicious code, phishing scams, and spam e-mails.



Efficient Network Policy Management

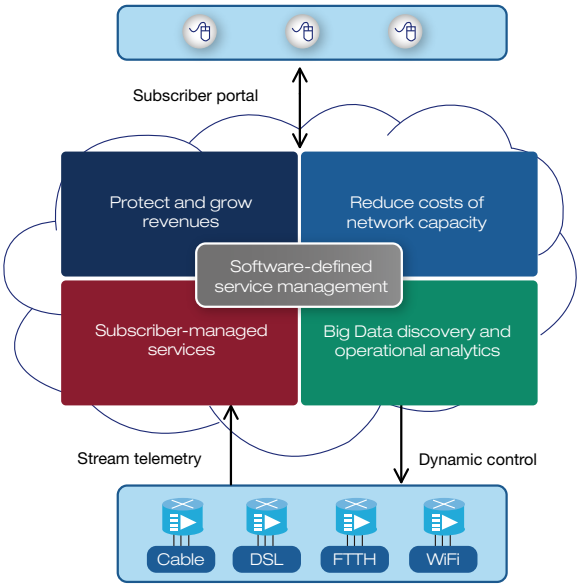
The role of the network administrator is crucial as networks become more complex due to growing business needs and malicious attacks increase in frequency and severity. As available time and resources are often limited, policy-based network management can be implemented to simplify and automate the tasks of the network administrator.

The CSA-5100/5200 allows the network administrator to set network policies based on protocols or type of service. These policies can be scheduled according to different needs during the day, or defined using other specific rules to ensure that every user has enough bandwidth to complete their tasks efficiently.

The CSA-5100/5200 is designed with a software-defined networking (SDN) controller that provides a built-in operations support system (OSS), which allows the network administrator to measure, manage, and monetize the network bandwidth and resources. This real-time network policy management ensures efficient network utilization while reducing operating costs without overloading hardware resources.

The CSA-5100/5200 provides the following Network Policy Management advantages:

- Cost Reduction – Efficient network policy management ensures cost savings by reducing system downtime and resources spent troubleshooting problems.
- Improved QoE – Monitoring of subscriber services to maintain and improve users' quality of experience.
- Revenue Growth – Smooth network operation increases efficiency and productivity, contributing to revenue growth.

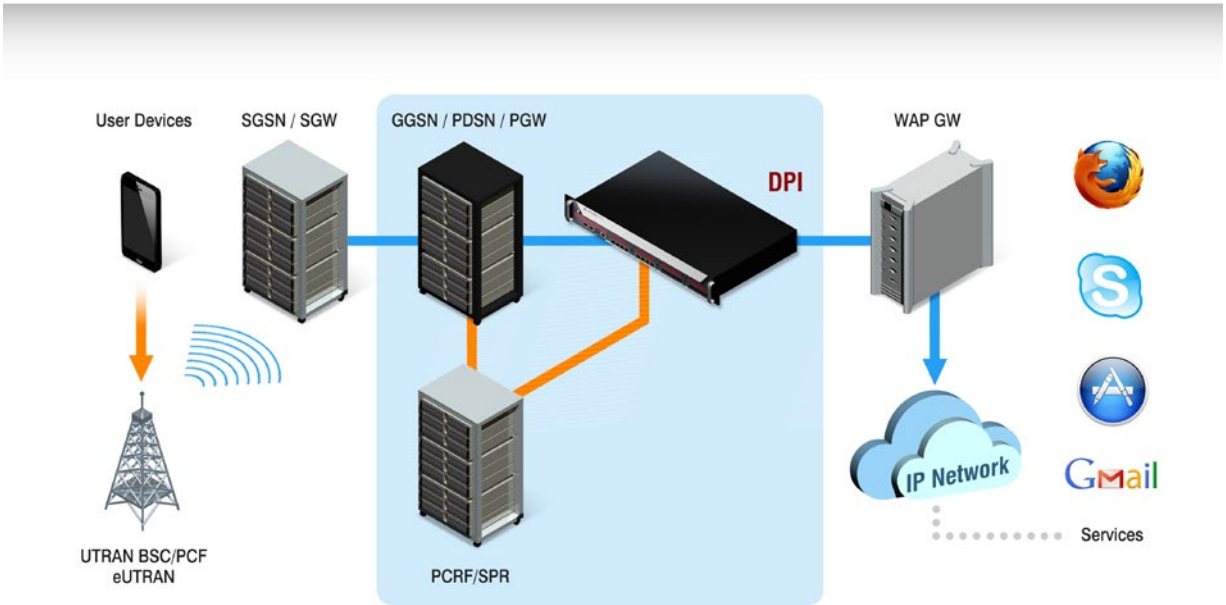


Deep Packet Inspection at All Layers

To ensure an even greater level of security, a Deep Packet Inspection (DPI) feature is available on the CSA-5100/5200 for increased network security. This DPI function is combined the NGFW and IDS/IPS to provide security at the packet level, which can be customized by the network administrator. This includes identifying service-based flows and automatically controlling flows to ease network maintenance. Furthermore, DPI can also combat threats at all layers, including the application layer, by configuring strict network policies both internally and at the gateway.

In recent years, video and voice applications have become common network traffic, even though these applications require high bandwidth. For example, according to Cisco's Visual Networking Index (VNI), broadband speeds will increase by almost threefold by 2018, with broadband speeds reaching 42 Mbps, up from 16 Mbps in 2013. These high-demand applications include Voice over IP (VoIP), video streaming from video-sharing websites and for video conferencing, and data transfers using cloud computing services. A challenge for the network administrator is to monitor and manage these traffic flows so that each user on the network can have enough bandwidth to work securely with efficiency. To ease this challenge, the DPI feature allows the network administrator to configure quality of service (QoS) priorities based on applications, protocols, and data type. This allows the available bandwidth to be utilized effectively and give users a better quality of experience (QoE).

Furthermore, as software applications migrate from the desktop to cloud-based applications, administrators must customize their networks to ensure that employees have enough bandwidth to be productive. According to Cisco's Virtual Networking Index (VNI), IP traffic not originating from PCs will grow from 33 percent in 2013 to 57 percent in 2018, with the bulk of the increase coming from handheld devices, IP television, and machine-to-machine (M2M) communication. To better handle the complexity of modern network traffic, DPI works on all 7 layers of the Open Systems Interconnection (OSI) model, including the Application Layer, instead of only inspecting at the port (Layer 1, physical), data link layer (Layer 2) and network layer (Layer 3).

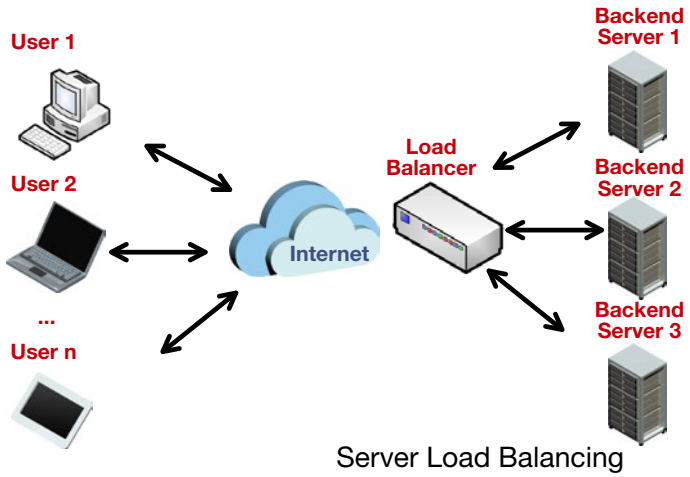


3.Cisco VNI, http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html

Optimized Load Balancing

Demand for data access has increased significantly in recent years. Whether it be an employee retrieving internal data or a potential customer seeking product information, data must be quickly and easily accessible. Data availability is dependent on the efficiency and reliability of the servers that are storing the data, and efficient use of the network to transport the data. Network administrators face the challenge of effective server utilization to ensure that the networks are accessible around the clock, as well as balancing demands amongst multiple servers being accessed simultaneously.

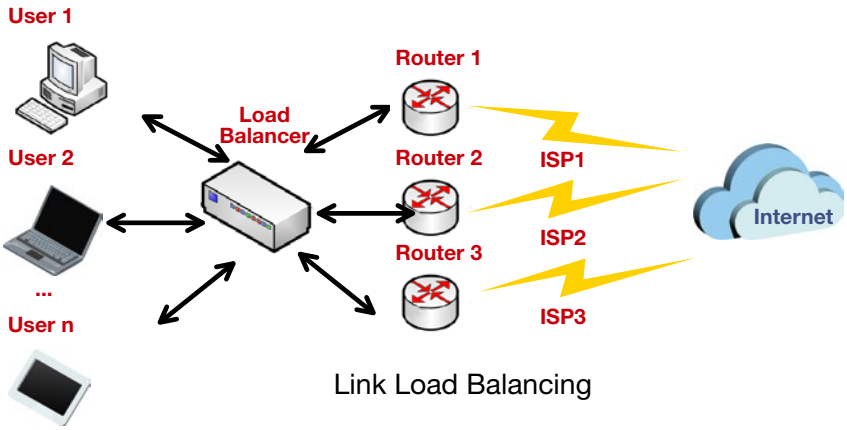
The CSA-5100/5200 is available with the ADLINK Load Balancing Toolkit, which allows network administrators to manage multiple servers and other network components as a single system. This simplifies management, increases server availability, and offers scalability.



Server Load Balancing

The CSA-5100/5200 with Load Balancing Toolkit provides the following functionality:

- Improved Server Utilization – Hardware resources are not overloaded by data being distributed across and accessed through multiple servers.
- High Availability – There is no single point of failure since redundant links become active automatically when the primary server is down.
- Scalability – Supports multiple clusters so that administrators can easily add more network components as required to expand capacity.
- Low OPEX – Load balancing improves server utilization and reduces expenditures resulting from server downtime.



Link Load Balancing

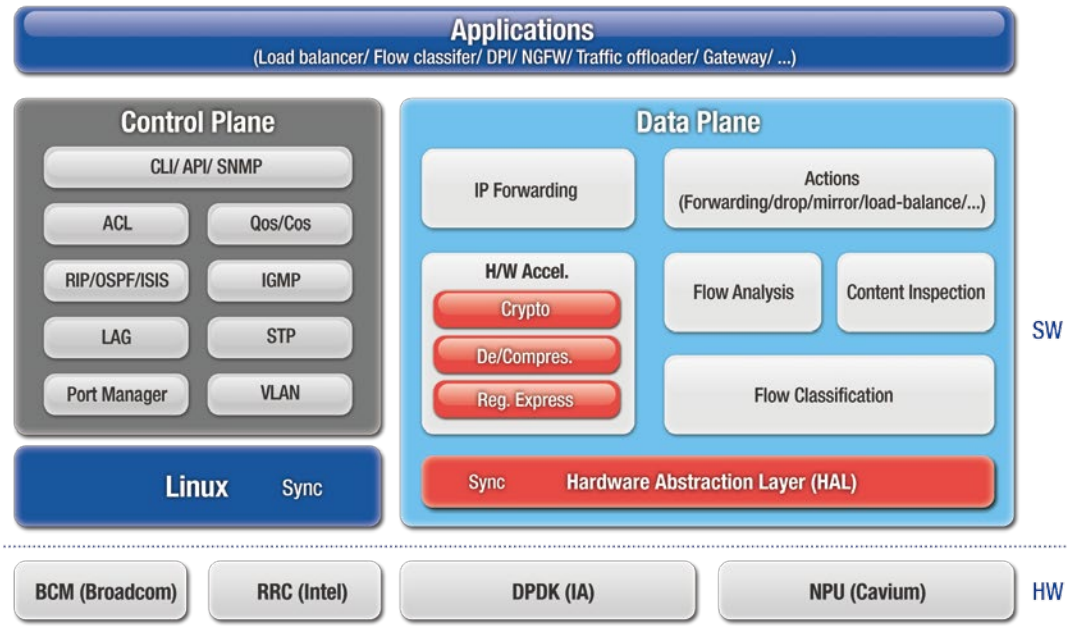
ADLINK PacketManager Benefits

PacketManager Overview

ADLINK PacketManager is a software package that enhances the capabilities and performance of the CSA-5100/5200. It includes a high-performance data plane component for packet receiving, inspection, processing, and forwarding, as well as a control plane component which is supports network protocols such as Virtual LAN (VLAN), Spanning-Tree Protocol (STP), Link Aggregation Control Protocol (LACP), Internet Group Management Protocol (IGMP), Routing Information Protocol (RIP), Open Shortest Path First (OSPF), and Border Gateway Protocol (BGP).

Furthermore, the control plane offers an easy management interface using command line interface (CLI), Application Programming Interface (API), and Simple Network Management Protocol (SNMP).

PacketManager supports and enhances critical network applications such as security, load balance, flow processing, and packet inspection.



ADLINK PacketManager offers the following improvements over native Linux:

- Linear forwarding/load-balancing performance
- Scalable performance increasing by CPU and port number
- Higher performance:
  Wire-speed Layer 2/3 and flow-based switching
  Customizable L2/L3 tables
  Customizable rule/action tables
  Wire-speed switching based on defined access control list (ACL) rules
- Shorter Time-to-Market & Reduced CAPEX
- Easy management using rich API library and development tools

Control Plane Software

Built using the Linux operating system as a foundation, the ADLINK PacketManager control plane includes the most commonly used Layer2/3 protocols and API features, including VLAN, LAG, IGMP, STP, RIP, OSPF, BGP, ISIS, ACL and QoS. The control plane also takes ownership of updating the protocol state/information, including port state/statistics, ARP/routing tables, and relative protocols states, and then synchronizes the data with the data plane.
For easy deployment and management, ADLINK PacketManager not only provides a friendly command line interface (CLI), but also includes remote procedure call (RPC) based APIs to allow further customization and integration with the customers' management systems.

Data Plane Software

In contrast to the control plane, the ADLINK PacketManager data plane provides a fast path to process packets using pre-defined routines, without extra protocol interaction. Generally, with the exception of protocol packets which are sent to the control plane for further processing, the data plane can process most packets at a linear rate relative to that of the physical interfaces.
ADLINK PacketManager provides a range of customizable data plane routines to classify the incoming packets based on traditional destination IP as well as innovative flow tuples, then perform deeper checking and processing such as flow analysis and content inspection, and finally execute pre-defined actions on the matched packets, such as drop, mirror, QoS, or forwarding.
The data plane also includes hardware acceleration components, including data encryption/decryption, compression/decompression, and regular expression handling, to help offload valuable CPU resources that can be used for other packet processing tasks.

Features

- Layer 2 Features
  - Port status manager to provide the state and statistics of each physical interface
  - VLAN configuration, management, monitoring
  - Support for STP/LACP protocols
  - ARP & Neighbor Discovery update and sync
- Layer 3 Features
  - Support for IPv4/IPv6 RIP/OSPF/BGP/ISIS protocols
  - IPv4/IPv6 route table update and sync
  - VLAN routing
  - IGMP snooping and IGMP proxy
- Flow-based Features
  - Flow classification based on 5-tuple or OpenFlow compliant 13-tuple
  - Flow analysis to identify a flow based on application recognition
  - Content inspection to identify a flow based on
  - RegEx-based rules
  - Miscellaneous flow actions, including drop, forward, load-balance, speed-limit
- Miscellaneous
  - Access Control List (ACL) for flow classification & forwarding control
  - Quality of Service (QoS) for differentiated service
  - Sync of ARP and routing information between control and data planes
  - Hardware acceleration libraries, including encryption/decryption, compression/decompression and regular expression handling
- Configuration & Management
- Command-line interface (CLI)
- Remote procedure call (RPC) library for remote calling
- SNMP MIB for remote management
- Robust logging mechanism for easy debug

Applications

ADLINK PacketManager can be easily used by customers to develop and deploy mainstream applications, especially for applications which require high performance packet processing ability and a wide range of protocol support, such as:

- L2/L3 switching/routing
- L4/L7 load balancing
- Deep Packet Inspection (DPI)
- Next-generation firewall, security gateway
- 3G/LTE/C-RAN network traffic offloader/accelerator
- Wi-Fi access point controller
- SDN/NFV solutions

Fast Application Development using ARiP

ADLINK ARiPs (Application-Ready Intelligent Platforms) are a set of validated integrated building blocks, including hardware, operating system, and software components (firmware & middleware). ARIPs provide hardware level integration and validation using ADLINK's standard product lines; OS validation, performance tuning, and virtualization certification; as well as a variety of toolkits for system and power management. Software packages for ARIPs include the ADLINK PacketManager for data plane and network control functions, and the ADLINK MediaManager which expands on the Intel® Media SDK to provide a comprehensive end-to-end solution for media processing tasks.

FastPath for Quick Packet Processing

PacketManager includes FastPath, which has adopted the Intel DPDK and optimized it for its hardware platforms using hardware abstraction to give a common API to end user applications regardless of hardware architecture,

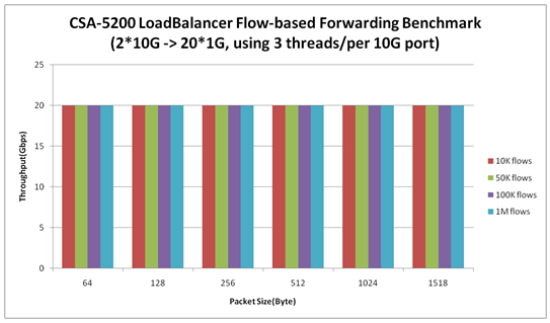
Accelerated Content Inspection using RegEx

Regular expression (RegEx_ engines engines can be either hardware-based or software-based when used on x86 processors. The RegEx engine (software) uses optimized search algorithms to greatly speed the pattern matching sequence.

PacketManager uses a software-based RegEx engine on x86 hardware and can utilize a hardware-based accelerator if installed in the the CSA 5100/5200's PCIe x4 expansion slots to significantly accelerate content inspection while performing Deep Packet Inspection.

Flow-based Load Balancing Performance

As can be seen in the chart below, the CSA-5100/5200 is able to equally balance flow-based traffic loads using a total 6 CPU threads to receive 20Gbps packets via two 10G ports, and then load balance the throughput to twenty 1G ports at line speed.



Conclusion

ADLINK meets the network security requirements of e-businesses, enterprises, and service providers with the CSA-5100/5200 Network Appliances that allow security solution providers to integrate next generation firewall (NGFW), virtual private network (VPN), intrusion detection system (IDS), traffic shaping, content filter, Deep Packet Inspection (DPI), Unified Threat Management (UTM) and anti-virus applications with industry leading performance, scalability, serviceability and manageability, all in one comprehensive security solution.
With PacketManager, a software package which includes Control Plane configuration tools and Data Plane processing acceleration capabilities, the CSA-5100/5200 provide increased packet processing speed and are ideal for Software Define Networking (SDN) switch and NGFW applications that provide DPI and network virtualization functionality.

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About ADLINK

ADLINK Technology is enabling The Internet of Things (IoT) with innovative embedded computing solutions for edge devices, intelligent gateways and cloud services. ADLINK's products are application-ready for industrial automation, communications, medical, defense, transportation, and infotainment industries. Their product range includes motherboards, blades, chassis, modules, and systems based on industry standard form factors, as well as an extensive line of test & measurement products and smart touch computers, displays and handhelds that support the global transition to always connected systems. Many products are Extreme Rugged™, supporting extended temperature ranges, shock and vibration.

ADLINK Technology is a Premier Member of The Intel® Internet of Things Solutions Alliance, one of the world's most recognized and trusted technology ecosystems. Members of The Intel® Internet of Things Solutions Alliance include leading solution and service providers from a broad range of industries, who provide the hardware, software, firmware, tools, and systems integration that developers need to take a leading role in the rise of intelligent systems.

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