PICOS® The First Two-in-One Open Network Operating System (NOS) Coupling Full Enterprise Support with "Classic" SDN

Overview

Almost a decade ago Pica8 was first to market with an open Linux-based NOS running on a variety of commodity white box networking switches. Close to 1,000 customers later, Pica8's PICOS® network operating system now supports all major L2/L3 switching and routing protocols while continuing to deliver both "classic" SDN solutions through Pica8's adoption of Open-vSwitch (OVS) as well as a groundbreaking blended implementation that practically applies SDN-like control – without service interruption -- directly onto operational L2/L3 networks. We describe this as the infinitely programmable network.

ITS SOFTWARE! HOW WOULD YOU LIKE IT DELIVERED?

Easy to install, leveraging the open-source Open Network Install Environment (ONIE) boot loader as well as Zero-Touch Provisioning (ZTP) tools

Qualified on multiple white box switches from a variety of manufacturers

Perpetual (one-time payment) license

Choose Enterprise or SDN Editions

- Traditional switching and routing support is key for easy integration into existing network topologies, so PICOS has it
- PICOS also delivers classic SDN solutions through the adoption of Open-vSwitch (OVS) and northbound interfaces
- Pica8's innovative dual control plane CrossFlow™ technology allows concurrent OpenFlow control of traditional L2/L3 switching and routing network ports for the first time
- Table Type Patterns (TTP) and memory table management allow for greater flow scale

Boot with a CLI or boot with Linux

- PICOS offers a comprehensive and flexible configuration management environment from a feature-rich command line interface (CLI) or a Linux shell
- Unlike competitive offerings, PICOS runs as an application on an unmodified Linux kernel. This gives PICOS users full access to all other Debian applications with a standard apt-get command. It also enables automation tools such as Chef, Puppet, Ansible, and Salt to automate network provisioning, and lets users add other agents or controllers that they may want to implement
- Ensure rapid service provisioning through multiple open programming interfaces and enabling DevOps automation

THE TWO FLAVORS OF PICOS

PICOS ENTERPRISE EDITION
L2/L3 WITH CROSSFLOW™

A PICOS Enterprise Edition license includes the Debian Linux OS, L2/L3 switching and routing features, and Pica8's new CrossFlow feature, a dual control plane technology that enables all ports in a network to be both L2/L3 and Openflow controlled, all without interrupting flow processing or requiring switch restarts.

PICOS SDN EDITION

A PICOS SDN Edition license includes the Debian LinuxOS and a full set of OpenFlow features through Version 1.5

BOTH PICOS VERSIONS INCLUDE

- Open network operating system built on the robust Debian Linux environment
- The ability to leverage a vast array of standard Linux tools as a common management and operations framework
- Zero Touch Provisioning (ZTP) functionality coupled with ONIE delivers a true white box-to-application environment
- IPv4 and IPv6 Static Routing

PICOS Enterprise Edition Highlights

- CrossFlow dual control plane technology for improved OpenFlow integration, scale, and management (Layer-2 / Layer-3 and OpenFlow running simultaneously on switch ports)
- Rich OSPF and BGP protocol stacks for integrating PICOS into existing spine/leaf architectures
- IPv6 routing protocol support (OSPFv3, MBGP)
- Multicast PIM support (PIM SM, PIM SSM)
- MPLS support (Labeled-BGP)
- NAT (depends on specific ASIC capabilities)
- VXLAN network virtualization (depends on ASIC support)

Protocols and Standards (Release 2.10.2)

LAYER 2 FORWARDING AND PROTOCOLS SUPPORTED

- Jumbo frames
- Flow control & PFC
  - IEEE 802.3x for full-duplex mode
  - Back-pressure flow control in half duplex mode
- Broadcast, unicast, and multicast storm protection
- IGMP (v1/v2) snooping
- IGMP snooping query per-VLAN
- VLAN support
  - IEEE 802.1Q VLAN
  - 4,094 VLANs
  - Port-based VLANs
- Spanning Tree
  - IEEE 802.1D STP
  - IEEE 802.1w RSTP
  - IEEE 802.1s MSTP
  - PVST (Per VLAN Spanning Tree)
- BPDU/LACP tunneling
- UDLD
- IEEE 802.3ad Link aggregation
  - Up to 128 trunk groups depending on model
  - Up to 8 ports per trunk group
- Port mirroring (many-to-one)
- Port security
- LLDP – Link Layer Device Discovery Protocol /LLDP-MED
- Q-in-Q
- Multi-chassis Link Aggregation (MLAG)
- MLAG with Spanning Tree support
- VXLAN Tunnel Endpoint (VTEP) support
- 802.1p in Layer 2 forwarding
- 802.1X support
- PTP E2E Mode

LAYER 3 ROUTING FEATURES

- Dual stacked IPv4 and IPv6 addressing
- IPv4 and IPv6 static route configuration
- ECMP: 32 next hops
- ECMP resilient hashing (depends on ASIC support)
- RIPv2
- OSPFv2 (IPv4)
- BFD (Bidirectional Forwarding Detection)
- MP-BGP (IPv4, IPv6)
  - Static MPLS LSP
  - Labeled BGP (RFC3107)
- VRRP
- DHCP-relay including DHCP option-82
- IGMPv1/v2/v3
- PIM-SM and PIM-SSM
- VXLAN Tunnel Endpoint (VTEP)
- VxLAN over mLAG
- GRE tunneling over LAG interfaces

IPV6 LAYER 3 ROUTING FEATURES

- OSPFv3
- MP-BGP for IPv6 NLRI

QUALITY OF SERVICE

- IEEE 802.1p-based CoS
- 8 priority queues per port
- TOS or DSCP-based CoS
- ACL classification, metering, and remarking
- SP, WRR, WFQ scheduling
- Tail drop
- WRED congestion control
- Policy-based DiffServ
- Map Traffic to Different Queues
- Voice VLAN
- Buffer management

SECURITY

- User/password protected system management
- L2/L3/L4 ACLs
- TACACS+ AAA
- SSHv1/v2
- SSLv3/TLS v1
- DoS attack protection
- COPP – Control Plane Policing & Statistics
- Dynamic ARP Inspection
- Enable/disable USB port for USB memory
- Dynamic ARP inspection

CROSSFLOW

- *Network Address Translation (NAT) (depending on ASIC support)
- Drop counters statistics on ASIC
- QoS (1R2C/2R3C, WRR, WRED)
- Support for User-defined-flows (UDF) with L2/L3/L4 offset for inner headers matching
- Map Traffic to Different Queues
- ECN (Explicit Congestion Notification) on UC (unicast) and MC (multicast) queues
- *SCTP (Stream Control Transmission Protocol) traffic filtering
- VLAN push/pop operation in L2 MPLS
- Based on Open-vSwitch (OVS) 2.3
- Compatible with OpenFlow 1.5 specification
- TCAM Flow Optimization for better scalability and performance
- Interoperable with Open Daylight, ONOS, HPE's VAN, NEC's ProgrammableFlow Controller, and RYU
- OpenFlow encapsulation: L2oGRE, L3oGRE, NVGRE, PBB, VXLAN, MPLS (depending on ASIC support)

Network Management

- Command line interface (CLI)
- Telnet and SSH remote login
- Centralized control plane policing and filtering
- SNMPv1/v2c/v3
- AAA RADIUS support
- IPFIX (NetFlow)/sFlow

Operational Programming Tools

- Automate PICOS installation via ONIE
- Auto provisioning with scripting capacity (Zero Touch Provisioning)
- Debian 7.0 Linux distribution
- Modular PICOS: Service daemon for L2/L3 Mode and OVS Mode • Standard Debian Based package upgrade (apt-get)
- Extensible CLI with Scripts and APIs
- Configuration Commit / Check / Rollback
- C/C++, Ruby, Python, Perl
- Configuration Management: Puppet, Chef, CFEngine (user-installed), Ansible, Salt
- NETCONF/YANG model support for L2/L3 mode.

IEEE Standards Compliance

- 802.1D Bridging and Spanning Tree Protocol
- 802.1s Multiple Spanning Tree Protocol
- 802.1w Rapid Spanning Tree Protocol
- 802.1p QOS/COS
- 802.1Q VLAN Tagging
- 802.1X Port-based Network Access Control (PNAC)
- 802.1ah PBB (MAC in MAC)
- 802.3ad Link Aggregation with LACP
- 802.3ab 1000BASE-T
- 802.3z Gigabit Ethernet
- 802.3ae 10 Gigabit Ethernet
- 802.3by 25/50 Gigabit Ethernet
- 802.3ba 40 Gigabit Ethernet
- 802.3ba 100 Gigabit Ethernet

RFC – SPECIFIED MIBS

- RFC 1157 SNMPv1
- RFC 1212 Concise MIB definition
- RFC 1213 MIB II
- RFC 1215 SNMP traps
- RFC 1256 ICMP router discovery
- RFC 1493 Bridge MIB
- RFC 1573 Interface Evolution MIB
- RFC 1643 Ether-like MIB
- RFC 1901 Community based SNMPv2
- RFC 1905 Protocol Operations for SNMPv2
- RFC 1906 Transport Mappings for SNMPv2
- RFC 1907 Management Information Base for SNMPv2
- RFC 1908 Coexistence between SNMPv1 and SNMPv2
- RFC 1997 BGP Communities Attribute
- RFC 2021 RMON2 probes
- RFC 2096 IP Forwarding table MIB
- RFC 2233 The Interface Group MIB using SNMPv2
- RFC 2439 BGP Route Flap Damping
- RFC 2545 Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing
- RFC 2665 Ethernet-like Interfaces
- RFC 2796 BGP Route Reflection – An Alternative to Full Mesh IBGP
- RFC 3065 Autonomous System Confederations for BGP
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4893 BGP Support for Four-octet AS Number Space
- RFC3107 - Labeled BGP
- RFC4607 - PIM SSM
- RFC3376 - IGMPv3
- RFC6241 NETConf
- Pica8 Private MIB
- UCD-SNMP-MIB

PICOS SDN Edition Highlights

- Leverages OpenFlow to control MPLS, GRE, NVGRE or VXLAN tunnels, delivering on the promise of open programmability
- Support for all major OpenFlow controllers, including OpenStack Neutron ML2, ONOS, Open Daylight, HPE's VAN, NEC's ProgrammableFlow Controller, and Ryu
- OpenFlow 1.5 User-Defined Fields for looking deep into packets of interest

OpenFlow

- Web interface/GUI for OVS configuration
- Interoperable with Open Daylight, ONOS, HPE's VAN, NEC's ProgrammableFlow Controller, and RYU
- Table Type Patterns (TTP) support for Unicast and Multicast pipelines
- Configure a LAG as MTP (Mirrored Traffic output Port)
- 802.1ag Connectivity Fault Management (CFM) in PICOS OVS / OpenFlow mode.

Pica8 Support

Pica8 provides world-class support and services to help our customers and partners fully leverage the power of PICOS and open systems automation, network management and monitoring software and appliances. Additionally, Pica8 offers a full range of support services that include access to our Support and License portals, online or phone support teams and tools 24/7/365, advanced RMA for selected hardware, and on-site support for customers of all sizes. We want to ensure our customers and partners can quickly and easily manage and troubleshoot their solutions.

For more information, visit http://www.pica8.com

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