

PICOS Routing and Switching Configuration Guide

Pica8 PicOS supports Layer 2 switching protocols, including: STP, RSTP, MSTP, MAC learning, and Q-in-Q. PicOS also supports several Layer 3 protocols, including: static routing, RIPv2, OSPF, IGMP, PIM-SM, and IPv6. This guide provides instructions and examples for configuring switches and controllers. Intended for system administrators, this guide assumes a working knowledge of Layer 2 and Layer 3 protocols.


PicOS can run in 2 different modes of operation:

- **Open vSwitch (OVS) Mode:** In this mode, PicOS is dedicated and optimized for OpenFlow applications.
- **Layer 2/Layer 3 (L2/L3) Mode:** In this mode, PicOS can run switching and routing protocols, as well as OpenFlow applications.

In OVS mode, L2/L3 daemons are not running, and the system is fully dedicated to OpenFlow and OVS. In L2/L3 mode, L2/L3 daemons are running, and OVS can also be used if [CrossFlow](#) is activated.

This chapter assumes that user is running PicOS L2/L3 mode. Please see [PICOS Mode Selection](#) to learn how to switch between L2/L3 and OVS modes.

Warning:

 On N3048EP-ON, N3048ET-ON, N1148T-ON and N3132PX switches, run "copy running-config startup-config" command when set L2 / L3 CLI commands. Otherwise, the L2 / L3 configuration will be lost after PicOS reboot. For detail, please refer to [Configuration Saving Guide](#).

Supported Features

Collection of Feature Specification of Different Platforms

Command-Line Interface

- [From Linux Shell to L2/L3 Shell](#)
- [Operation Mode and Configuration Mode](#)
- [Displaying the Current Configuration](#)
- [Display Setting Configuration](#)
- [Rolling Back a Configuration](#)
- [Managing Configuration Files](#)
- [Saving and Loading Configuration Files](#)
- [Commit Confirmed](#)
- [Commit Check](#)
- [Commit Failed and Exit Discard](#)
- [Configuring a Command Alias](#)
- [Configure L2/L3 from Linux Shell](#)
- [Bash Linux Shell](#)
- [PicOS Upgrade and Configuration Change](#)
- [Set CLI](#)
- [CLI Configuration](#)
- [Configuring Multi-window Command Configuration Display on The User Terminal](#)
- [Configuration Saving Guide](#)

System Administration

- [In-band Management Interface](#)
- [Configuring User Account and Login Banner](#)
- [AAA Configuration Guide](#)
 - [Introduction](#)
 - [Configuration Notes of AAA](#)
 - [TACACS+ Configuration](#)
 - [RADIUS Configuration](#)
 - [Local Authentication Configuration](#)
 - [Sample configuration file on the AAA server](#)
- [Configuring SSH Parameters](#)
- [Configuring the Log-in ACL](#)
- [NAC Configuration Guide](#)
 - [Principle of NAC](#)
 - [Configuration Notes of NAC](#)
 - [Configuring NAC](#)
 - [Configuration Example of NAC](#)
 - [Example for Configuring 802.1X Authentication](#)
 - [Example for Configuring MAB Authentication](#)
 - [Example for Configuring CWA Authentication](#)
 - [Example for Configuring Multiple Authentication Modes](#)
 - [Typical Configuration of NAC](#)
 - [Example for Configuring NAC \(PacketFence as the Authentication Server\)](#)
 - [Solution Documents Download](#)
 - [References](#)
- [Configuring NTP and the Time Zone Parameter](#)
- [Configuring PTP](#)
- [Configuring the linux-config-unreliable](#)

- Configuring IPFIX
- Configuring sFlow
- Configuring the Syslog Log Level
- Configuring the Syslog Disk and Syslog Host
- Displaying System Information
- IPv6 Management Support
- Configuring NETCONF
- SNMP Configuration
 - Configuring SNMPv2
 - Configuring SNMPv3
 - Configuring SNMP ACL
 - PICA8 Private MIB
 - pica_private_mib.my
 - pica_private_trap_mib.my
 - PICA8 Public MIB
- PoE Configuration Guide
 - Configuring PoE
 - PoE over LLDP Power Negotiation
 - UPoE
- Configuring USB Disable
- Configuring CPU Usage Alarm Threshold
- Configuring MAC Usage Alarm Threshold
- Configuring Mirroring
- Configuring Mirroring Guide

Interface Management Configuration Guide

- Ethernet Ports Management Configuration
 - Physical Ethernet Port Configuration
 - Interface Rate Configuraion
 - Introduction of Interface Rate
 - Configuring the Interface Rate
 - Configuring the Force Rate of an Interface
 - Configuring the Auto-Negotiation Mode
 - Port Security Configuration
 - CDR Function Configuration
 - Time Domain Reflectometry (TDR)
 - Configuring Port Breakout and Merge
 - Configuring Port Mapping On S4148 Series Switch
 - 10G-Base-KR Interface Configuration
 - Forwarding Error Correction (FEC)
- Configuring a Loopback Interface

Layer 2 Switching Configuration

- Static MAC entries and Dynamic MAC Address Learning
- Cut-Through Switching Method
- MLAG Configuration
 - Principle of MLAG
 - Configuration Notes and Constraints
 - Configuring MLAG
 - Configuration Example of MLAG
 - Example for Configuring a Basic MLAG
 - Example for Configuring MLAG with Active-Active-VRRP
 - Example for Configuring MLAG with DHCP Snooping
 - Example for Configuring MLAG with IGMP Snooping
 - Example for Configuring MLAG with Rapid PVST+
 - Example for Configuring MLAG with VXLAN
 - MLAG Maintenance and Troubleshooting
 - How to bind a LAG interface to the MLAG link?
 - How to check whether the VLAN configuration on the two peer-link ports are consistent?
 - How to confirm whether the MAC address table has been correctly synchronized?
 - How to enable MLAG traceoptions
 - How to ensure the reliability of the peer link?
 - How to verify configurations on MLAG peer are consistent?
 - How to verify MLAG link status?
 - How to verify MLAG neighbor status?
 - How to verify that the peer link connection status is normal?
 - How to view and clear MLAG statistics?
- VLAN Configuration
- Q-in-Q Basic Port Configuration
- Private VLAN Configuration Guide
 - Introduction of PVLAN
 - Configuration Notes of PVLAN
 - Configuring PVLAN
 - Example for Configuring PVLAN
- Voice VLAN Configuration Guide
 - Principle of Voice VLAN

- Configuration Notes of Voice VLAN
- Configuring Voice VLAN
- Configuration Example of Voice VLAN
- Link Aggregation Configuration
 - Static Link Aggregation (LAG) Configuration
 - Link Aggregation Control Protocol (LACP) Configuration
 - LAG Hashing Configuration
 - LAG Hashing Configuration and Example
 - LAG Hash Mapping
 - Resilient LAG Hashing Configuration and Example
- Symmetric Hash for LAG Configuration Example
- LLDP Configuration (Link Layer Discovery Protocol)
- LLDP MED Configuration
- MSTP Configuration
- MSTP Configuration Example
- Rapid PVST+ Configuration
- Rapid PVST+ Configuration Example
- BPDU Tunneling Configuration
- UDLD Configuration
- LFS Configuration
- Storm Control in Ethernet Port Configuration

Layer 3 Routing Configuration

- Layer 3 VLAN Interface Configuration
- ARP Configuration
 - Configuring ARP
 - Dynamic ARP Inspection (DAI)
 - Flushing ARP and the Neighbor Table
- Configuring IP Routing
- Static Routing Configuration
 - Configuring Static Routes
 - Example for Configuring IPv4 Static Routes
- VRF Configuration Guide
 - Introduction to VRF
 - Configuration Notes of VRF
 - Configuring a User-defined VRF
 - Enabling Management VRF
 - Example for Configuring Basic VRF
- DHCP Configuration
 - Introduction to DHCP
 - Configuration Notes of DHCP
 - Configuring DHCP Server (IPv4)
 - Configuring DHCP Relay (IPv4)
 - Example for Configuring DHCPv6 Relay
 - Configuring DHCP Snooping
 - Typical Configuration Example for DHCP Relay and DHCP Snooping
 - RFC Lists
- Default Administrative Distance Values
- OSPF (Open Shortest Path First)
 - OSPF Overview
 - Basic OSPF Configuration Tasks
 - Basic OSPF Configuration Example
 - OSPF Area Type Configuration Example: NSSA, Stub and Standard Areas
 - OSPF Stub and NSSA Areas with no-summary
 - OSPF Area Range Configuration Guide
 - OSPF Route Redistribution and Route Maps
 - Example for Configuring OSPF with Different VRFs
 - OSPFv3 Configuration Guide
 - OSPF Multi-Instance Support
- ECMP (Equal-Cost Multipath Routing) Configuration
- Symmetric Hash for ECMP Configuration Example
- VRRP Configuration
 - Principle of VRRP
 - Configuration Notes of VRRP
 - Configuring Standard VRRP
 - Configuring Active-Active VRRP
 - VRRP Configuration Example
 - Example for Configuring Standard VRRPv3 for IPv4
 - Example for Configuring Active-Active VRRPv3 for IPv4
 - Example for Configuring Active-Active VRRPv3 for IPv6
- BGP Configuration
 - BGP Introduction
 - BGP Regular Expressions
 - Basic BGP Configuration
 - Configuring BGP Security
 - Configuring a BGP Route Reflector
 - Configuring BGP Timers
 - Configuring BGP Route Aggregation

- Configuring BGP Dynamic Neighbors
- Configuring eBGP Multihop
- Configuring Removing and Replacing Private ASNs from the AS Path
- Configuring BGP Multipath
- Configuring BGP to Import Routes
- Enable BGP Read-only Mode
- Configuring Route Maps for Route Updates
- Configuring BGP Attribute
 - Configuring the AS_Path Attribute
 - Configuring the BGP Community Attribute
 - Configuring the MED Attribute
 - Configuring the Next_Hop Attribute
- Configuration Examples
 - Example for Configuring Basic BGP Functions
 - Example for Configuring a BGP Route Reflector
 - Example for Configuring BGP Load Balancing
- Routing Map Configuration
 - Routing Map Introduction
 - Configuring Filters
 - Configuring a Community Filter
 - Configuring a Large Community Filter
 - Configuring an AS_Path Filter
 - Configuring an Extended Community Filter
 - Configuring an IP Prefix List
 - Configuring a Routing Map
 - Example for Filtering the Routes to Be Advertised and Receiving
- IPv6 Support
 - IPv6 Neighbor Discovery Configuration
 - PICOS L2/L3 Support for IPv6
- VRF Route Leaking Configuration
 - Static Route Leaking Example

IP Multicast Routing Configuration

- IGMP Configuration
- PIM Configuration Guide
 - Introduction of PIM
 - Configuring PIM-SM
 - Configuration Example of PIM
 - Example for Configuring Basic PIM-SM
 - Example for Configuring PIM-SM
 - Example for Configuring PIM-SSM
 - RFC List of PIM
- IGMP Snooping Configuration Guide
 - Introduction to IGMP Snooping
 - Configuring IGMP Snooping
 - Configuration Example of IGMP Snooping
 - RFC List

ACL Configuration

- Configuring Basic ACL

QoS Configuration

- Weighted Random Early Detection
 - WRED Overview
 - WRED Configuration Tasks
 - WRED Configuration Example
- QoS Principle
- SP Configuration Example
- WRR Configuration Example
- WFQ Configuration Example
- QoS Configuration Example
 - Configuring Classifier-based QoS
 - Configuring ACL-based QoS
- PFC Configuration Example
- Buffer Management
- ACL-based Traffic Policer
- CoPP Configuration Guide
 - Principle
 - Default Settings for CoPP
 - CoPP Configuration
 - Configuration Notes
 - Configuring CoPP
 - Configuration Example
- Queue-based Rate Limiting

- Interface-based Rate Limiting
 - Configuring Egress Interface-based Rate Limiting
 - Configuring Ingress Interface-based Rate Limiting

VXLAN Configuration

- VXLAN Configuration Guide
- VXLAN Base Configuration Example
- VXLAN ECMP Configuration
- OVSDB VTEP Configuration
 - Configuring an OVSDB VTEP
 - OVSDB VTEP with Midonet Configuration
 - OVSDB VTEP with NSX Configuration
 - OVSDB VTEP with vtep-ctl Configuration Examples
- VXLAN Routing
 - Cross-Subnet Packet Forwarding Process
 - Example for Configuring VXLAN for Different Subnets

BGP EVPN Configuration Guide

- BGP EVPN Route Types
- EVPN Symmetric Routing Configuration Example
- EVPN Asymmetric Routing Example
- EVPN Enhancements
- EVPN With NAC Configuration Guide

OpenFlow in Crossflow Mode

- Crossflow Mode Introduction
- CrossFlow Mode Known Limitations
- Crossflow Basic Configuration
- Configuration Example1 in Crossflow Mode
- Configuration Example2 in Crossflow Mode
- Example for Configuring STM Resource Allocation
- Multi-action in crossflow mode