

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

Unsupported Functions on N1148T-ON

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 a User Account](#)
- [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
- Example for Configuring Inband Management Interface on N1148T-ON

Ethernet Ports Management Configuration

- Physical Ethernet Port Configuration
- Interface Rate Configuration
 - 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

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 Port Configuration
- Q-in-Q Basic Port Configuration
- Voice VLAN Configuration Guide
 - Principle of Voice VLAN
 - Configuration Notes of Voice VLAN
 - Configuring Voice VLAN
 - Configuration Example of Voice VLAN
- 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
- 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
- IGMP Snooping Configuration Guide
 - Introduction to IGMP Snooping
 - Configuring IGMP Snooping
 - Configuration Example of IGMP Snooping
 - RFC List

Layer 3 Unicast Routing Configuration

- Layer 3 VLAN Interface Configuration
- ARP Configuration
 - Configuring ARP
 - Dynamic ARP Inspection (DAI)
 - Flushing ARP and the Neighbor Table
- Configuring IP Routing
- 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 of DHCP
 - Configuration Notes of DHCP
 - Configuring DHCP Relay
 - Configuring DHCP Snooping
 - Typical Configuration Example for DHCP Relay and DHCP Snooping
 - RFC Lists
- Default Administrative Distance Values
- Static Routing Configuration
- Static Routing Configuration Example
- RIPv2 Routing Protocol Configuration
- RIPv2 Routing Configuration Example
- OSPF (Open Shortest Path First)
 - OSPF Overview
 - Basic OSPF Configuration Tasks
 - Basic OSPF Configuration Example
 - OSPFv3 Routing Protocol Configuration
 - OSPF Configuration Example: NSSA Stub Normal
 - OSPF Stub Area NSSA Summary
 - OSPF Virtual Link Configuration Guide
 - OSPF Area Range Configuration Guide
 - OSPF Route Import and Export
 - Overview
 - Configuring OSPF Route Import and Export
 - Example for Configuring OSPF Introducing Route by Using Export
 - Example for Configuring OSPF Import and Export
 - Example for Configuring OSPF with Different VRFs
- BFD Protocol Configuration
- BFD Basic Configuration Example
- 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
- IPv6 Neighbor Configuration
- IPv6 Static Routing Configuration
- IPv4/IPv6 BGP Configuration
 - IPv4 BGP configuration
 - BGP Configuration Guide
 - BGP Basic Configuration Example
 - BGP Route Reflector Configuration Example
 - BGP Confederation Configuration Example
 - BGP Load Balancing Configuration Example
 - IPv6 BGP Configuration
 - IPv6 BGP Introduction
 - Building Peering Sessions
 - EBGP Peering
 - IBGP Peering
 - Establish BGP Peer Use 4-byte-AS-Number
 - Sources of Routing Updates
 - Injecting Information Dynamically into BGP
 - Injecting Information Statically into BGP
 - BGP Attributes
 - The NEXT_HOP Attribute
 - The AS_PATH Attribute
 - The LOCAL_PREF Attribute
 - The MULTI_EXIT_DISC Attribute
 - The COMMUNITY Attribute
 - BGP-4 Aggregation
 - Synchronization
 - Controlling Large-Scale Autonomous System
 - Confederations
 - Route Reflectors
 - Redundancy and Load Balancing
 - Designing Stable Internets
 - Label BGP
 - Labeled BGP Support
 - Configuration Example for Labeled Support
 - IPv4 Labeled BGP Configuration
 - IPv6 Labeled-BGP Configuration
 - Debugging CLI for Labeled-BGP
- IPv6 RA Guard Configuration

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 SPT Switchover in PIM-SM Domain
 - Example for Configuring PIM-SSM
 - RFC List of PIM

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

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