



# QCT Network Operating System (QNOS)

Best-In-Class  
Networking OS for Cloud

- **In-Service Software Upgrade (ISSU)**
- **Virtual eXtensible LAN (VXLAN) and Routing In and Out of Tunnels (RIOT)**
- **Multi-Chassis Link Aggregation (MLAG)**
- **OSPF, BGP4 with ECMP**
- **Network Automation**
- **RoCEv1/v2, DCBX, and FIP SNP**

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QCT Network Operating System (QNOS) is the modern software platform for data centers and cloud networks which is based on Broadcom's ICOS platform for tradition L2/L3 features as well as software-defined network (SDN) applications. Inherited from ICOS, QNOS is a proven protocol stack solution that can run on several control plane processors including PowerPC, x86, and ARM with robust operating performance and flexible deployment. For the fundamentals of modern data center networks such as network automation, virtualization, high availability and data center orientated features, QNOS provides a comprehensive feature set to cover all types of applications.



### Automation

With the rapid adoption of cloud computing and the proliferation of big data and parallel calculations, the need for data center network devices is growing exponentially, making network automation a critical factor. Supporting auto installation, RESTful API, NETCONF/RESTCONF, Ansible and PSME (Pooled System Management Engine), QNOS facilitates easy deployment to build-up a mass data center with Infrastructure-as-a-Service (IaaS).



### Virtualization

Virtualization technology has been booming up fast and widely required in data center for the Cloud computing and virtual machines (VMs) applications. To provide the scalability and stretched ability of L2 environment, QNOS supports Virtual eXtensible LAN (VXLAN) running over the existing L3 network infrastructure. BGP-EVPN is also introduced in QNOS to support the VXLAN tunnel creation automatically and reduce network overhead.



### High Availability

For data center network robust operations, QNOS eliminates single-point of failure with the following features:

- Spanning Tree with Guarding Features
- In-Service Software Upgrade (ISSU)
- Multi-chassis Link Aggregation (MLAG)
- Up to 48 paths ECMP routing for load balancing and redundancy
- Virtual Router Redundancy Protocol (VRRP) and Bidirectional Forwarding Detection (BFD)



### Data-Center Orientated

To build up a network infrastructure with a high bandwidth and low latency for network storage or high computing requirements, QNOS supports RoCEv1/v2, DCBX, and FIP SNP to fulfill the needs of modern data center applications.

# QCT Network Operating System (QNOS) Specifications

## Layer 2 Features

- **Switching Mode:** Store-and-Forward
- **Spanning Tree:**
  - 802.1w
  - 802.1s
  - Auto Edge
- **VLAN :**
  - IEEE 802.1Q Tagged Base
  - Port-Based
  - QinQ (802.1ad)
- **Storm Control:**
  - Broadcast
  - Unknown Multicast
  - DLF (Unknown Unicast)
- **IGMP Snooping:**
  - v1/v2/v3
  - v1/v2 Querier
  - Immediate Leave
- **MLD Snooping v1/v2**
- **Link Aggregation:**
  - 802.3ad with LACP
  - Static Trunk
  - Unicast/Multicast Traffic Balance over Trunking Port
  - LACP Fallback
- **Link State Tracking**
- **Port Backup**
- **Loopback Detection**
- **Private VLAN**
- **Link Debounce**

## QoS Features

- **Scheduling for priority queue:**
  - WRR, Strict, Hybrid
- **COS:** 802.1p, IP TOS precedence, DSCP
- **DiffServ**
- **iSCSI optimization**

## Security Features

- **Static and dynamic port security (MAC-based)**
- **802.1x (MD5, MS-CHAPv2):**
  - Port-based
  - MAC-based
  - Auto VLAN assignment
  - Guest VLAN
  - Unauthenticated VLAN
- **Access Control List:** L2/L3/L4
- **IPv6 ACL:** L3/L4
- **RADIUS/TACACS+:** Authentication, Authorization, Accounting
- **SSH V2.0**
- **User name and password:**
  - Local Authentication
  - Remote Authentication via RADIUS/TACACS+, AAA
- **Management IP filtering:**
  - SNMP
  - Telnet
  - SSH
- **SSH Public key Authentication**
- **IP Source Guard**
- **Dynamic ARP inspection (DAI)**
- **DHCP snooping:** IPv4, IPv6

- **Control Plane Policing (CoPP)**
- **Service Prohibit Access**
- **Role Base Access Control (RBAC)**

## Layer 3 Features

- **IP Multinetting/CIDR**
  - /31 subnets
- **Proxy ARP**
- **Static route:** IPv4, IPv6
- **OSPFv2/v3**
- **ECMP**
- **BGP4**
- **IGMP v1/v2/v3**
- **PIM-SM/SM6**
- **MLD v1/v2**
- **VRRPv2**
- **Policy-Based Routing (PBR)**
- **BFD**
- **VRF Lite**
- **Black Hole Detection (BHD)**
- **VRRPv3**
- **IP SLA**

## Management Features

- **Industrial command-line interface**
- **CLI filtering**
- **CLI scheduler**
- **SSH**
- **Software update:**
  - TFTP, SCP, SFTP
- **Configuration download/upload:**
  - TFTP, SCP, SFTP
- **Dual Images**
- **SNMP v1/v2c/v3**
- **SNMP inform v2**
- **RMON1 Groups: 1, 2, 3, & 9**
- **BOOTP:** client/relay
- **DHCP client**
- **DHCP relay**
- **EVENT/Error log**
- **DNS client**
- **Remote PING**
- **Traceroute**
- **NTPv4**
- **LLDP:**
  - 802.1ab
  - Potential error detection
- **UDLD**
- **Port mirroring:** SPAN, RSPAN
- **sFlow v5**
- **Email alerting:** SMTP
- **Error-Disable Recovery**
- **Fluentd**
- **SNTP**

## IPv6 Management

- **IPv4/IPv6 Dual Protocol Stack**
- **ICMPv6**
- **ICMPv6 Redirect**
- **IPv6 Neighbor Discovery**
- **Stateless Autoconfiguration**
- **Manual Configuration**
- **DHCPv6 client/relay**
- **SNMP over IPv6**
- **SSH over IPv6**

- **IPv6 DNS Resolver**
- **IPv6 RADIUS**
- **IPv6 TACACS+**
- **IPv6 Syslog**
- **IPv6 SNTP**

## High Availability

- **Multi-Chassis Link Aggregation (MLAG)**
  - L2 Unicast/Multicast
  - L3 Unicast
  - RSTP/MSTP
  - VXLAN
- **In-Service Software Upgrade (ISSU)**

## Data Center Features

- **Enhanced Transmission Selection (802.1Qaz)**
- **Priority-based Flow Control (802.1Qbb)**
- **DCBX:** DCBX for ETS, DCBX for PFC, DCBX for Application Priority
- **FCoE Initiation Protocol (FIP) snooping**
- **RoCEv1/v2**

## Automation

- **Auto Installation**
- **RESTful API**
- **Ansible**
- **Pooled System Management Engine (PSME)**
- **NETCONF/RESTCONF**

## Virtualization Features

- **VXLAN**
- **RIOT**
- **BGP-EVPN for VXLAN**

## SDN

- **OpenFlow v1.3**

# QCT Network Operating System (QNOS) Specifications

Features	IX7D	IX8D	IX1	LB9M	LB9	LY4R	P05	LY2R	LY3	LY6/8/9
<b>New Features</b>										
1-PASS RIOT	19.12 ~	19.12 ~	No	No	No	No	No	No	No	No
ECN (RoCEv2)	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No	No
IPv6 PBR	19.12 ~	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No
IP SLA	19.12 ~	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No
VRRP-BFD	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No	No
Link Debounce	19.12 ~	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No
BGP-EVPN with VXLAN	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No	No
Auto-Nego on 40G/100G	19.12 ~	19.12 ~	No	No	No	No	No	No	No	No
DCBX App Priority Originator	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No	No
RESTful API of ACL	19.12 ~	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No
RESTful API of IGMP SNP	19.12 ~	19.12 ~	19.12 ~	19.12 ~	No	No	No	No	No	No
ISSU	19.06 ~	19.06 ~	19.06 ~	No	No	No	No	No	No	No
MLAG with MSTP and VXLAN	19.06 ~	19.06 ~	19.06 ~	No	No	No	No	No	No	No
Black Hole Detection (BHD)	19.06 ~	19.06 ~	19.06 ~	No	No	No	No	No	No	No
NETCONF/RESTCONF w/ YANG	19.06 ~	19.06 ~	19.06 ~	No	No	No	No	No	No	No
<b>L2 Features</b>										
IGMP SNP	Yes	Yes	Yes	19.06B01~	Yes	Yes	Yes	Yes	Yes	Yes
Link State Tracking	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Port Backup	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Private VLAN	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>QoS Features</b>										
iSCSI Optimization	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Layer 3 Features	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
IGMPv1/v2/v3	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
PIM-SM/SM6	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
MLDv1/v2	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
BFD	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
VRF Lite	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
VRRPv3	Yes	Yes	Yes	No	No	No	No	No	No	Yes
<b>Management Features</b>										
IPv4/v6 SNTP	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>High Availability</b>										
MLAG	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
<b>Data Center Features</b>										
ETS	No	No	No	No	No	No	Yes	Yes	Yes	Yes
PFC (RoCEv1)	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
DCBX	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
FIP SNP	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
<b>Automation Features</b>										
PSME	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Yes (Exclude LY6)
<b>Virtualization Features</b>										
VXLAN	Yes	Yes	Yes	No	No	No	No	No	No	Yes

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