

# OneOS - V3.7



OneOS is a feature-rich operating system that provides a common IP fabric, functionality and maintenance interface across your network. It is present on the complete ONE product range.

OneOS guarantees a common feature set across the different product lines and uniform support by maintenance and management tools.

This document describes all features in the V3.7 release.

## Products Supported

ONE20

ONE60

ONE80

ONE100

ONE180

ONE200

ONE300

ONE400

## INTERFACE CHARACTERISTICS

The definition of an "interface" on equipment entirely depends on the configuration of the unit and can correspond to the following:

- A physical interface, e.g. an Ethernet interface, a serial interface,..
- A Frame-Relay DLCI
- An ATM PVC
- An Tunnel
- A VLAN

Every interface supports all IP services (input/output QOS, inbound/outbound firewall, NAT, IP SEC) and can serve as source IP address for every management protocol.

## IP ADDRESS ASSIGNMENT

- BOOTP/DHCP server (RFC 2131, RFC 2132) with static or dynamic address assignment
- DHCP relay agent (RFC 2131, RFC 2132)
- Static IP address assignment
- Static ARP entries
- Automatic IP assignment through BootP client (RFC 951)
- Automatic IP assignment through DHCP client (RFC 2131, RFC 2132)
- Automatic IP assignment through PPP IPCP
- Unlimited assignment of secondary IP address on LAN interface
- Unnumbered interfaces (tunnel or (ML-)PPP interfaces)
- Automatic default route assignment on remotely learned IP address in PPP

## NETWORK ADDRESS TRANSLATION (NAT AND PAT)

- Compliant with RFC 3022
- NAT mode for one-to-one private to public IP address translation
- PAT mode for many-to-one private to public IP address translation (also called port mapping, single address NAT or NAPT)
- NAT/PAT configurable on any interface (the interface with the public address(es))
- Twice NAT
- Static NAPT on port range
- TCP/UDP server load balancing
- Easy NAT: self learning of overloaded IP address
- Selective NAT (translate only traffic matching access lists) and NAT bypass (translate all except traffic matching ACL)
- Application Layer Gateway (ALG) Support
- Session limiting. Denial of Service protection.

## MISC. IP ROUTER FUNCTIONS

- DNS proxy
- DHCP relay
- IP Helper address
- DHCP server: multiple pools, static MAC-IP binding, configurable ASCII and hexa options
- DynDNS

## TUNNELING AND VPNs

### L2TP tunneling

- The Layer 2 Tunneling Protocol emulates a point-to-point connection over an IP network
- Compliant with RFC 2661
- Available on WAN and LAN interfaces
- Tunnel authentication
- Static and dynamic tunnels. Dynamic tunnels are set-up only if data is to be sent.
- One L2TP tunnel between each pair of IP addresses
- One PPP session per L2TP tunnel
- L2TP tunnels can be set up from an interface running NAT/PAT
- L2TP backup tunnels
- Tunnel accounting

### GRE Tunneling

- Generic Routing Encapsulation (GRE) (RFC 1701-1702)

### IPSec security

- Compliant with RFCs 2401 and succeeding
- IPSec tunnel mode
- ESP (Encapsulation Security Payload), allowing authentication of the sender and encryption of the data (RFC 2406)
- DES (56 bits; RFC 2405), 3DES (3 \* 56 bits; RFC 2451), AES (up to 256 bits) and NULL (RFC 2410) encryption
- HMAC (Keyed-Hashing for Message Authentication) based on MD5 (RFC 2403) and SHA-1 (RFC 2404) for integrity and authentication
- Manual SA (Security Association)
- IKE pre-shared SAs
- RFC 2408 "Internet Security Association and Key Management Protocol"
- RFC 2407 "IP Security Domain of Interpretation for ISAKMP"
- RFC 2409 "Internet Key Exchange" (IKE)
- NAT Traversal (NAT-T) in compliance with RFC 3947 and 3948

Note: On the standard equipment, the software handles the IPSEC encryption. As this is a processor-consuming task, the forwarding performance of the equipment decreases. Therefore, some products are also available with a hardware accelerator chip. This chip takes care of the encryption / decryption, unburdening the software of this task.

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## IP ROUTING

The equipment complies with the router requirements as stated in RFC 1812 and supports the routing of standard IP packets (RFC 791) between the different interfaces on the equipment. Common IP router features:

- Path MTU discovery
- Variable Length Subnet Mask (VLSM) RFC1878
- Classless Inter-Domain Routing (CIDR)
- Loopback interfaces
- Equal Cost Multi-Path Routing (ECMP): load sharing active for routes with equal distance/cost
- Configurable MTU
- ICMP redirect
- TCP Maximum Segment Size (MSS) clamping
- ARP proxy

Several routing protocols are available. The routes are selected in the Routing Information Base by discriminating on every route the cost and administrative distance. The administrative distance is configurable for every routing protocol. The following routing modes are available:

### Static Floating Routes

Routing is based on static routing entries in the routing table. Alternate routing is possible through the use of different administrative distance for different routes to the same destination.

### Policy-Based Routing

Normal routing is based on the destination IP address. Policy based routing offers the possibility to define different routing entries based on additional higher layer information. Traffic is routed to a certain interface or gateway based on one or more of the following parameters:

- Source and destination IP address range
- Type Of Service (TOS) value range (8 bits in the IP header, also called DSCP bits)
- IP protocol
- Source and destination port range for UDP / TCP packets

### RIP

- RIP1 compliant with RFC 1058
- RIP2 compliant with RFC 2453
- Split horizon and selective router updates per interface
- RIP2 authentication with MD5 hashing or clear text
- Triggered RIP for ISDN interfaces
- Route Distribution list (prefix-list, ACL)
- Redistribution of routes: default, static, connected, BGP, OSPF
- Route redistribution filtering with route maps

### Multicast Routing

OneOS supports the routing of multicast flows (such streaming video over a corporate VPN):

- IGMPv1/v2/v3 (Internet Group Management protocol, RFC 2236)
- Static multicast routes
- PIM-SM (Protocol Independent Multicast – Sparse Mode) version 2

### BGP4 (hardware dependent)

- Border Gateway Protocol version 4 (RFC 1771) (IBGP and EBGP)
- RFC2385 authentication
- Peer groups
- Update source configurable
- EBGP multi-hop
- Maximum prefix
- Allow AS loop
- Redistribution of routes: default, static, connected, BGP, OSPF
- Route distribution filtering: route maps, prefix-lists
- Received routing update filtering
- Soft peer reset
- ECMP routes
- Backdoor routes
- Local preference
- Community lists
- AS path filter
- AS confederations
- Route reflector
- Flap dampening

### OSPF

- Compliant with RFC 2328 (OSPF version 2)
- Route summarization and route suppression through range definitions on areas
- Encryption through simple password or MD5 encryption chains
- Stub areas, OSPF NSSA (RFC 3101)
- Virtual links
- Passive interface support
- Cost tuning
- RFC1583 compatibility option
- MTU check override
- Overflow management
- Redistribution of routes: default, static, connected, BGP, OSPF
- Route redistribution filtering with route maps
- ECMP routes

## FIREWALL

- Firewall is based on advanced access-list functions
- Firewall policies attached to interface inbound/outbound direction
- Access lists can be attached to internal server applications (SSH, telnet...)
- IP extended access lists filter on the following parameters:
  - Source IP address range
  - Destination IP address range
  - Type Of Service (TOS) value range (8 bits in the IP header, also called DSCP bits)
  - IP protocol
  - Source port range for UDP / TCP packets
  - Destination port range for UDP / TCP packets

- Stateful inspection firewall
  - TCP, UDP, FTP
  - Half open session management
  - Rule logging
  - Detection of malicious IP
- Reflexive filters
- Reverse path check

## VRRP

- Virtual Router Redundancy Protocol in accordance with RFC 3768
- Multiple VRRP instances
- Priority adjusted based on critical interface status or route presence monitoring



## BRIDGING AND VLANs

- Bridge virtual interface (BVI). Can be attached to ATM, LAN, VLAN and Wifi interfaces (allows VLAN to PVC mapping)
- VLAN support (802.1Q)
- Within a bridge group, an IP address can be defined
- Between different bridge-groups in the equipment, routing may be enabled
- Multiple VLANs possible between a bridge group towards the IP router
- IP TOS to 802.1P COS mapping and COS to TOS mapping are available on the LAN interface and the data sent between a bridge group and the IP router in order to maintain priority information when changing from IP to VLAN or vice versa.
- On the LAN interfaces and in bridge groups, MIB2 performance counters are available per VLAN

## IP QUALITY OF SERVICE (QoS)

IP QoS can be enabled on any input/output logical IP interface. At the input, it is possible to classify packets and mark them with DSCP/precedence value and apply policing. At the output, the same processing is possible as well as traffic shaping and congestion avoidance.

### Classification Criteria

- Access-lists
- Input interface
- RTP
- DSCP / precedence
- 802.1p tag
- Virtual QoS group

### Marking

- DSCP / precedence
- 802.1p tag
- ATM CLP and FR DE tag on selected hardware platforms
- Virtual QoS group

### DiffServ

The data is redirected to the queues based on DiffServ (RFCs 2474, 2475) regarding class and drop precedence. This means that, depending on their Type Of Service (TOS) field, some packets are moved to other queues and/or dropped sooner than other packets in case the queue is full.

This simple and flexible policy allows classifying the traffic based on a user-defined range of the TOS field into one of the queues

### Traffic Conditioning (Policing)

Per class, a committed information rate (cir) and peak information rate (pir) are configurable. Traffic that exceeds the cir/pir value is no longer serviced conform the selected priority policy. For traffic conforming/not conforming or violating the policing rates, the packets can be remarked with different precedence or be simply dropped.

### Traffic Shaping

- Low Latency Queuing (LLQ) for real-time classes. Maximum latency configurable.
- Class-Based Queuing (CBQ). Remaining bandwidth distribution strategy is configurable.
- Congestion avoidance management:
  - Tail drop
  - RED, WRED
  - Class-Based Weighted Fair Queuing: for every class, a queue per detected stream is created dynamically. The bandwidth allocated per class is equal ly shared between all flows.

## ACCESS SECURITY

The equipment is password protected for access through the different maintenance and management tools. For each router one can define a variety of users, where each user can be given a customised access-right to the equipment.

The unit also features a Radius client (RFC 2865) and TACACS+, that can be used for authentication, authorisation and accounting (AAA) of network maintenance sessions, or for L2TP sessions initiated by remote devices.

Per interface, one can enable/disable all access to the device for traffic coming from this interface. Overall access with specific management tools can be prohibited (telnet, SSH, HTTP, SNMP, TFTP, FTP).

All accesses (successful and failed logins) are logged.

## AUTOCONFIGURATION

Autoconfiguration enables a zero-touch CPE activation. Based on standard protocols, the OneOS products can update its configuration and software image. The products minimize installation time and risks of errors.

## PERFORMANCE PROBE

Performance probe is an application within OneOS sending ICMP test packets to measure network performance. The benefits of this measurement tool are to simulate and report an evaluated application performance.

Measured performance metrics are: one-way jitter, packet loss and round trip delays. Performance can be reported using SNMP and already integrated in market-leading performance monitoring platforms.

## MAINTENANCE AND MANAGEMENT TOOLS

- Web configurator
- Industry-standard Command Line Interface (CLI)
- Local console
- SSH V2/TELNET with command line
- Http server with customisable configuration web pages
- PING (RFC 792) request and reply with extended options
- Traceroute command with extended options
- TFTP configuration and software download (RFC 1350)
- FTP configuration and software download (RFC 414)
- Interface packet capture and decoding
- SNMP version 1 (RFC 1157)
- SNMP version 2 (RFCs 3416-3418).
- SNMP version 3 (RFCs 3413-3415)
- SNMP MIB2 (RFC 1213), private MIB
- SNMP traps (RFC 1215)
- SNMP views
- SYSLOG event logging generation (RFC 3164)
- Simple Network Time Protocol client (SNTP) (RFC 2030)
- Dual software image allows secure firmware upgrades on selected platforms
- Mode to automatically recover last working configuration

## PPP ENCAPSULATION

- Over ATM, ISDN, analog dialup modem, serial interface (E1/T1 or X.21 or V.35)
- Encapsulation compliant with RFC 1661, 1662
- LCP (Link Control Protocol)
- IPCP (IP Control Protocol, RFC 1332)
- CHAP authentication with MD5 hashing (RFC 1994), unidirectional or bi-directional authentication
- PAP (PPP Authentication Protocols, RFC 1334), unidirectional or bi-directional authentication
- Link aggregation with Multi-link PPP (RFC 1990) on ATM and ISDN
- MLPPP fragmentation and interleaving on ATM, ISDN and serial interface
- Bandwidth Allocation Protocol (BAP) (RFC 2125) for ISDN interfaces

## FRAME-RELAY ENCAPSULATION

- Encapsulation compliant with RFCs 1490, 2427
- CIR (Committed Information Rate) configurable per DLCI
- EIR (Excess Information Rate) configurable per DLCI
- Different types of LMI (Local Management Interface):
  - ANSI T1.617 D
  - ITU-T Q933 Annex A
  - "Group of four"
- Frame-relay fragmentation (FRF 12)
- Frame relay shaping with four-level priority scheduling

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## ATM ENCAPSULATION

- Higher layer protocols:
  - Classical IP according to RFC 1577
  - Bridged Ethernet (for bridged traffic or routing to ATM interface with IPoEoA encapsulation)
  - PPPoA (PPP over ATM) according to RFC 2364
  - PPPoE (PPP over Ethernet) according to RFC 2516, 2684
- Multiprotocol encapsulation using
  - LLC (Logical Link Control)
  - VC (Virtual Connection) multiplexing
- Inverse ARP for automatic IP address resolution
- Configuration of PCR (Peak Cell Rate) per PVC
- Service categories UBR, CBR, VBR-rt and VBR-nrt (hardware dependent)
- ATM forum UNI 3.1/4.0 PVCs
- OAM F5 loop back response (ITU-T I.610)
- OAM F5 end-to-end loop back generation (ITU-T I.610)
- OAM F5 end-to-end RDI response
- OAM F5 segment and end-to-end CC (Continuity Cells)
- ATM IMA over E1 links (ATM Forum af-phy-0086.001 and ITU-T G.761) and G.SHDSL

## DIAL-UP INTERFACES

- Applicable to ISDN-BRI, ISDN-PRI, PSTN and GPRS/EDGE interfaces
- Multiple logical dial-up interfaces on a physical link (incoming, outgoing, specific calling numbers)
- PPP and Multi-link PPP encapsulation for routed IP traffic
- Bandwidth on demand for ISDN (with or without Bandwidth Allocation Protocol (BAP) (RFC 2125))
- Call filtering on incoming and / or outgoing calls, local and remote telephone number
- ISDN call-back
- Interface or route monitoring to cause dial-up interface opening (dialer-watch-list)
- Interface remaining open only for selected traffic (dialer-group)

## VOIP PROCESSIONG (DSP)

- Codecs: G.711a/μ, G.726, G.729AB
- G.165/168 compliant echo cancellation
- T.38, including Error Correction Mode (ECM)
- Modem detection
- DTMF tone detection
- Caller-id, name, date on FXS
- FXS Advice of Charge
- Local tone generation (ringback, busy...)

## SIP GATEWAY AND SIP PROXY

- SIP V2.0 (RFC3261)
- FXS, BRI, PRI
- CLIP/CLIR, RFC 3325
- ISDN:
  - Overlap and en-bloc ISDN dialing
  - UDI64k
  - ISDN channel specialisation
  - Interworking of advanced ISDN services into SIP
- Supported methods: INVITE (Re-INVITE), ACK, REGISTER, CANCEL, OPTIONS, UPDATE, PRACK, NOTIFY, SUBSCRIBE, REFER
- Call admission control
- Built-in SIP signalling debugger
- Advanced SIP proxy with NAT ALG

## MGCP

- Supported interfaces: FXS
- Fax support: passthrough or T.38 (draft-andreasen-mgcp-fax-04)
- DTMF: RFC2833 or MGCP DTMF event package
- Backup mode when CA connection is lost

## H.323

- H.323 version 4
- FXS, BRI, PRI
- RAI support
- H.235 authentication
- Hunting
- ISDN:
  - Overlap and en-bloc ISDN dialing
  - UDI64k
  - CLIP, CLIR, COLP, COLR, ...
  - ISDN channel specialisation
- Modem pass-through
- T.38
- DTMF: H.245 or RFC2833

## CIRCUIT EMULATION SERVICE (AAL-1, ONE200 ONLY)

- CES: E1 (structured/unstructured) or serial (X.21, V.35)
- Loop tests
- Adaptive Clock Recovery

## VoDSL (AAL-2 BLES)

- ATM Forum VMOA-00145: BRI, PRI, FXS
- ATM Forum VTOA-113
- Fax/modem support
- G.711 / G.726
- Clock recovery: DSL (hardware dependent), AAL-2, free-run

## MAIN CHANGES FROM ONEOS V3.6

802.1p tagging  
Web Configurator  
Voice MIB  
One-way jitter measurement probe  
T.38 ECM  
SIP proxy  
ADSL MIB  
Call Admission Control for SIP gateway and SIP-proxy  
SHDSL MIB  
WMM QOS for WLAN  
MLPPP on SHDSL multi-link  
Configuration recovery  
New products: ONE80, ONE180

## MAIN CHANGES FROM ONEOS V3.5

WLAN  
L2TP LAC client  
Public hotspot specific accounting and security features  
SIP Gateway  
PPPoE over Ethernet interface  
NAT ALG for H.323  
PPP over X.21 on ONE400  
IMA SHDSL on ONE400  
T.38 fax in NSE mode  
New products: ONE20, 100, 300

