FTOS

# E-Series • C-Series • S-Series

**Best-in-class Stability and Reliability**
**Unix-like NetBSD Modular OS**
**One FTOS Version for all Platforms**

## FTOS: Optimized for Portability, Resiliency and Scalability

FTOS, the Force10 Operating System, is the operating system that runs on Force10 switch/router product lines. FTOS is based on NetBSD, with application code developed and maintained by Force10 software engineers. A hardware abstraction layer (HAL) is used to make FTOS applications portable across product lines, without having to rewrite the application software for each platform.

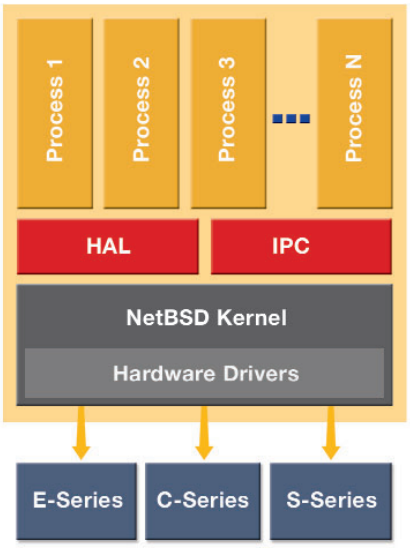
## Key Features

- NetBSD is a modern and highly portable Unix-like OS built on over 20 years of innovative research and development
- Its architecture makes it an ideal OS for high performance and resilient networks
- Enables increased software portability and modularity to bring high performance FTOS software features and CLI to all switch/router product lines
- Basis for stability with many architecture, resiliency, performance and security advantages

The NetBSD kernel provides a stable operating system, handling memory allocation and process scheduling, while all other applications run as independent and modular processes in their own protected memory space.

- Separate OS and application functions limits application scope and provides inherent platform stability
- Memory protection prevents processes from corrupting each other
- Preemptive process scheduling prevents processes from monopolizing the CPU
- Application processes for each Layer 2 and 3 protocol, as well as management functions, security services and other FTOS features

FTOS also supports a distributed, multiprocessor architecture with separate CPUs running FTOS for Layer 2 switching, Layer 3 routing and management functions on the E-Series platform. On the C-Series and S-Series switch/router platforms, there is a single FTOS CPU that performs all control plane and management functions.



FTOS Software Architecture

## The Power of One: Consistency

Force10 delivers a single version of FTOS for all platforms that follows a linear, sequential release path. By delivering the same OS across its entire switch/router line, including the E-Series, C-Series and S-Series platforms, Force10 ensures that customers benefit from stable code, a consistent configuration environment and simpler software management.

FTOS reliability and scalability characteristics provide the foundation for always-on networks and delivers many reliability and scalability benefits.

### *Stable Code*

- Single code base and single release train enables Force10 to perform more rigorous prerelease testing
- Customers benefit from more stable, reliable software and consistent CLI
- Greatly simplifies software maintenance because only one software upgrade process is required across all Force10 platforms

### *Scalable Protocols*

- FTOS control plane inherits a high degree of maturity and stability from its roots in NetBSD's high performance IPv4 and IPv6 stacks
- Advanced inter-process communication (IPC) mechanisms enable a scalable and distributed control plane
- Switching and routing protocols have been extensively tested and hardened through deployment in large global networks
- FTOS can accommodate the most demanding environments, reliably scaling to support very large, high performance networks

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FORCE10

# FTOS: E-Series • C-Series • S-Series

***Streamlined Management***

- Common management functionality and a common user interface across Force10 product lines make operating the network easier
- Simpler product training and learning curve because system configuration, diagnostics, troubleshooting and software maintenance are identical across all platforms
- Support for the same CLI, SNMP and XML management models throughout the entire network greatly simplifies life-cycle management of the infrastructure

Consistent functionality, a stable code base and a common management interface and tool set all help reduce operational expenses, thus lowering total cost of ownership (TCO). By supporting FTOS across all its switch/router products, Force10 extends the reliability and scalability benefits to all tiers of the network for optimal uptime.

# Specifications: FTOS

### IEEE Compliance

802.1AB Link Layer Discovery Protocol
802.1D Bridging, STP
802.1p L2 Prioritization
802.1Q VLAN Tagging, Double VLAN Tagging, GVRP
802.1s Multiple Spanning Tree Protocol
802.1w Rapid Spanning Tree Protocol
802.1X Network Access Control
802.3ad Link Aggregation with LACP
Cisco Per-VLAN Spanning Tree+

### RFC and I-D Compliance

#### General Internet Protocols

768 UDP
793 TCP
854 Telnet
959 FTP
1321 MD5
1350 TFTP
1661 PPP
1989 PPP Link Quality Monitoring
1990 PPP Multilink Protocol
1994 PPP CHAP
2474 Differentiated Services
2615 PPP over SONET/SDH
2698 Two Rate Three Color Marker
draft-ietf-bfd-base-03 BFD

#### General IPv4 Protocols

791 IPv4
792 ICMP
826 ARP
1027 Proxy ARP
1035 DNS (client)
1042 Ethernet Transmission
1191 Path MTU Discovery
1305 NTPv3
1519 CIDR
1542 BOOTP (relay)
1812 Routers
2131 DHCP (relay)
2338 VRRP
3021 31-bit Prefixes

#### General IPv6 Protocols

1886 DNS (client)
1981 Path MTU Discovery (partial)
2460 IPv6
2461 Neighbor Discovery (partial)
2462 Stateless Address Autoconfiguration (partial)
2463 ICMPv6
2464 Ethernet Transmission
2675 Jumbograms
3587 Global Unicast Address Format
4291 Addressing

#### RIP

1058 RIPv1
2453 RIPv2

#### OSPF

2154 MD5
1587 NSSA
2328 OSPFv2
2370 Opaque LSA
2740 OSPFv3
3623 Graceful Restart
4222 Prioritization and Congestion Avoidance

#### IS-IS

1142 IS-IS
1195 IPv4 Routing
2763 Dynamic Hostname
2966 Domain-wide Prefixes
3373 Three-way Handshake
3567 MD5
3784 Wide Metrics
draft-ietf-isis-igp-p2p-over-lan-06 Point-to-Point Operation
draft-ietf-isis-ipv6-06 IPv6 Routing
draft-kaplan-isis-ext-eth-02 Extended Frame Size

#### BGP

1997 Communities
2385 MD5
2439 Route Flap Damping
2545 Multiprotocol Extensions for IPv6
2796 Route Reflection
2842 Capabilities
2858 Multiprotocol Extensions
2918 Route Refresh
3065 Confederations
4360 Extended Communities
4893 4-byte ASN
draft-ietf-idr-bgp4-20 BGPv4
draft-ietf-idr-restart-06 Graceful Restart
draft-michaelson-4byte-as-representation-05 4-byte ASN Representation (partial)

#### Multicast

1112 IGMPv1
2236 IGMPv2
2710 MLDv1
3376 IGMPv3
3569 SSM for IPv4/IPv6
3618 MSDP
3810 MLDv2
3973 PIM-DM
4541 IGMPv1/v2/v3, MLDv1 Snooping
draft-ietf-pim-sm-v2-new-05 PIM-SM for IPv4/IPv6

#### Network Management

1155 SMIv1
1156 Internet MIB
1157 SNMPv1
1212 Concise MIB Definitions
1215 SNMP Traps
1493 Bridges MIB
1724 RIPv2 MIB
1850 OSPFv2 MIB
1901 Community-based SNMPv2
2011 IP MIB
2012 TCP MIB
2013 UDP MIB
2024 DLSw MIB
2096 IP Forwarding Table MIB
2558 SONET/SDH MIB
2570 SNMPv3
2571 Mangement Frameworks
2572 Message Processing and Dispatching
2574 SNMPv3 USM
2575 SNMPv3 VACM
2576 Coexistence Between SNMPv1/v2/v3
2578 SMIv2
2579 Textual Conventions for SMIv2
2580 Conformance Statements for SMIv2
2618 RADIUS Authentication MIB
2665 Ethernet-like Interfaces MIB
2674 Extended Bridge MIB
2787 VRRP MIB
2819 RMON MIB (groups 1, 2, 3, 9)
2863 Interfaces MIB
2865 RADIUS
3176 sFlow
3273 RMON High Capacity MIB
3416 SNMPv2
3418 SNMP MIB
3434 RMON High Capacity Alarm MIB
3580 802.1X with RADIUS
5060 PIM MIB
ANSI/TIA-1057 LLDP MED MIB
draft-grant-tacacs-02 TACACS+
draft-ietf-idr-bgp4-mib-06 BGP MIBv1
draft-ietf-isis-wg-mib-16 IS-IS MIB
IEEE 802.1AB LLDP MIB
IEEE 802.1AB LLDP DOT1 MIB
IEEE 802.1AB LLDP DOT3 MIB
ruzin-mstp-mib-02 MSTP MIB (traps)
FORCE10-BGP4-V2-MIB
FORCE10-FIB-MIB
FORCE10-CS-CHASSIS-MIB
FORCE10-IF-EXTENSION-MIB
FORCE10-LINKAGG-MIB
FORCE10-CHASSIS-MIB
FORCE10-COPY-CONFIG-MIB
FORCE10-MON-MIB
FORCE10-PRODUCTS-MIB
FORCE10-SS-CHASSIS-MIB
FORCE10-SMI
FORCE10-SYSTEM-COMPONENT-MIB
FORCE10-TC-MIB
FORCE10-TRAP-ALARM-MIB

#### Management Features

Industry-standard CLI
XML configuration and command output
Telnet, SSHv1/v2
TFTP, FTP, scp
NTPv3
SNMPv1/v2/v3
Syslog
sFlow traffic accounting
RADIUS/TACACS+ authentication
RMON (groups 1, 2, 3, 9)
Port monitoring
HP OpenView support

Feature capabilities vary between the E-Series, C-Series and S-Series due to hardware differences. Consult the data sheets and product manuals for specific details on supported software features for each platform.

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