

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.

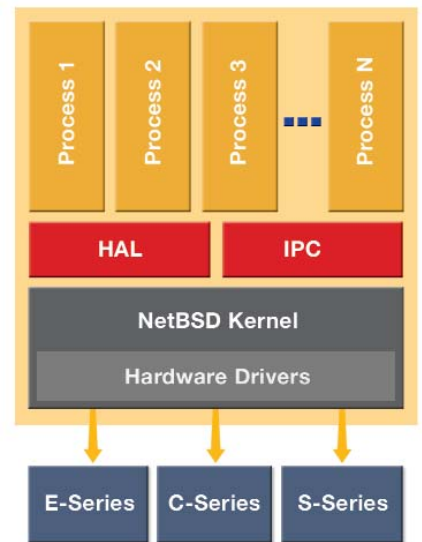
Key Features

- 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 leverages a distributed, multiprocessor architecture that delivers highly scalable protocols and reliability in each product line. E-Series Route Processor Modules (RPMs) are designed with separate control plane CPUs for Layer 2, Layer 3, and management functions with distributed processing on line card CPUs. The C-Series RPMs and S-Series switch/routers use one control plane CPU, with distributed processing on C-Series line cards and S-Series stack members.



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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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	LLDP
802.1D	Bridging, STP
802.1p	L2 Prioritization
802.1Q	VLAN Tagging, Double VLAN Tagging, GVRP
802.1s	MSTP
802.1w	RSTP
802.1X	Network Access Control
802.3ad	Link Aggregation with LACP
ANSI/TIA-1057	LLDP-MED
Force10	FRRP (Force10 Redundant Ring Protocol)
Force10	PVST+

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
3164	Syslog
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
1858	IP Fragment Filtering
2131	DHCP (relay)
2338	VRRP
3021	31-bit Prefixes
3046	DHCP Option 82
3069	Private VLAN
3128	Tiny Fragment Attack Protection

General IPv6 Protocols

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

1587	NSSA
2154	MD5
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
5120	Multi-topology
draft-ietf-isis-igp-p2p-over-lan-06	Point-to-Point Operation
draft-ietf-isis-ipv6-06	IPv6 Routing
draft-ietf-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	SMLv1
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	Management Frameworks
2572	Message Processing and Dispatching
2574	SNMPv3 USM
2575	SNMPv3 VACM
2576	Coexistence Between SNMPv1/v2/v3
2578	SMLv2
2579	Textual Conventions for SMLv2
2580	Conformance Statements for SMLv2
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
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)
sFlow.org	sFlowv5
sFlow.org	sFlowv5 MIB (version 1.3)

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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