TeraScale E-Series Switch/Routers

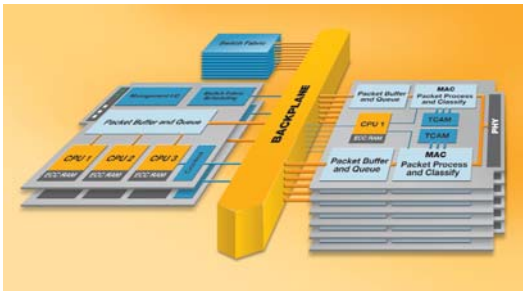
Best-in-Class Resiliency
Massive Scalability
1,260 GbE or 224 Ten GbE Ports per Chassis
Full L2 Switching and IPv4/IPv6 Routing

E-Series Overview

The Force10 E-Series switch/routers provide best-in-class resiliency, unmatched scalability, line-rate performance and full L2 switching and IPv4/IPv6 routing. Based on revolutionary system architecture that combines fully distributed hardware and modular software, the E-Series switch/routers ensure predictable application performance, increase network availability and reduce operating costs.

The Force10 E-Series sets a new standard for high performance switch/routers with unmatched scalability to 1,260 Gigabit Ethernet or 224 Ten Gigabit Ethernet ports per chassis, consistent performance with ACLs on all ports, and full L2 switching and L3 routing. These groundbreaking products simplify network applications from server/cluster consolidation, grid computing, campus backbones, and next-generation data centers.

The Force10 E-Series E1200/E600 provides 56.25 Gigabits per second per slot and the E300 delivers 25 Gigabits per second per slot. All deliver predictable line-rate performance with any combination of features enabled, deterministic low latency and jitter, robust L2/L3 functionality, and the resiliency to thwart denial of service (DoS) attacks. Built upon the powerful and cost-effective Force10 architecture, the E-Series sets the industry standard both for resiliency and performance.



The Force10 E-Series Architecture

The Force10 E-Series Architecture delivers line-rate performance, cost-effective scalability, and robust L2 switching and L3 routing:

- Three CPU Route Processor delivers best-in-class resiliency and security
- Scalable, non-blocking switch fabric enables the low latency and jitter critical for streaming media applications
- High performance Force10 ASICs distribute packet forwarding, ACL processing, QoS, and buffering to every line card
- Robust L2/L3 multiprocessor control plane with innovative control traffic filtering and rate limiting capabilities
- Cost-effective, reliable passive copper backplane technology maximizes system reliability and minimizes cost
- High availability features include hot-swap of all key components and system-wide environmental monitoring, maximizing system uptime and serviceability

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Specifications: TeraScale E-Series

Ordering Information

Order Number	Description
CH-E300	E300 6-slot chassis with backplane
CH-E600I	E600i 7-slot chassis with backplane
CH-E1200I-DC	E1200i-DC 14-slot DC power chassis with backplane
CH-E1200I-AC	E1200i-AC 14-slot AC power chassis with backplane
CC-E300-FAN	E300 fan subsystem
CC-E600-FAN	E600 fan subsystem
CC-E1200I-FAN	E1200i-AC fan subsystem
LC-EF3-RPM	E300 Route Processor Module (RPM) (series EF3)
LC-EF-RPM	E600/E1200 Route Processor Module (RPM) (series EF)
CC-E-SFM3	E-Series Switch Fabric Module 3 (SFM3)
CC-E300-PWR-DC	E300 DC Power Entry Module (PEM)
CC-E300-1200W-AC	E300 1200 W/800 W AC Power Supply Module (PSM)
CC-E600-PWR-DC	E600 DC PEM
CC-E600-2500W-AC	E600 2500 W/1500 W AC PSM
CC-E1200-PWR-DC	E1200 DC PEM
CC-E1200I-2800W-AC	E1200i-AC 2800 W AC PSM
LC-EF-10GE-4P	E600/E1200 4-port 10 GbE line card – XFP modules required (series EF)
LC-EG-10GE-4P	E600/E1200 4-port 10 GbE line card – XFP modules required (series EG)
LC-EF-10GE-16P	E600/E1200 16-port 10 Gigabit Ethernet line card – XFP modules required (series EF)
LC-EG-10GE-16P	E600/E1200 16-port 10 GbE line card – XFP modules required (series EG)
LC-EF-1GE-48P	E600/E1200 48-port GbE line card – SFP modules required (series EF)
LC-EG-1GE-48P	E600/E1200 48-port GbE line card – SFP modules required (series EG)
LC-EF-GE-48T	E600/E1200 48-port 10/100/1000Base-T line card with RJ45 interfaces (series EF)
LC-EG-GE-48T	E600/E1200 48-port 10/100/1000Base-T line card with RJ45 interfaces (series EG)
LC-EF-GE-48T1	E600/E1200 48-port high density 10/100/1000Base-T line card with RJ45 interfaces (series EF)
LC-EF-GE-90M	E600/E1200 90-port high density 10/100/1000Base-T line card with MRJ21 interfaces (series EF)
LC-EG-OC-48C-4P	E600/E1200 4-port OC-3c/ OC-12c/OC-48c POS line card – SFP modules required (series EG)
LC-EF3-10GE-2P	E300 2-port 10 GbE line card – XFP modules required (series EF3)
LC-EG3-10GE-2P	E300 2-port 10 GbE line card – XFP modules required (series EG3)
LC-EF3-10GE-8P	E300 8-port 10 GbE line card – XFP modules required (series EF3)
LC-EG3-10GE-8P	E300 8-port 10 GbE line card – XFP modules required (series EG3)
LC-EF3-1GE-24P	E300 24-port GbE line card – SFP modules required (series EF3)
LC-EG3-1GE-24P	E300 24-port GbE line card – SFP modules required (series EG3)
LC-EF3-GE-48T	E300 48-port high density 10/100/1000Base-T line card with RJ45 interfaces (series EF3)
SW-EF-LATEST	FTOS software

E300 Chassis

E300
6 line card slots
Size: 8 RU, 14 h x 17.4 w x 22.78" d
(35.6 h x 44.2 w x 57.8 cm d)
Weight (factory-installed components): 90 lbs (40.8 kg)
Weight fully loaded: 170 lbs (77.1 kg)
ISO 7779 A-weighted sound pressure level:
79.21 dBA at 73.4°F (23°C)
AC Power
Nominal input voltage: 100-240 VAC 50/60 Hz
Maximum thermal output:
6,989 BTU/h (2,049 W) at 100/120 VAC
6,483 BTU/h (1,900 W) at 200/240 VAC
Maximum input current per module:
7.2 A at 100 VAC 6.0 A at 120 VAC
5.1 A at 200 VAC 4.2 A at 240 VAC
Maximum system power input:
2.2 KVA at 100/120 VAC
2.0 KVA at 200/240 VAC
Maximum power consumption:
2,149 W at 100/120 VAC
2,000 W at 200/240 VAC
DC Power
Nominal input voltage: –44 to –60 VDC
Maximum thermal output: 5,596 BTU/h (1,640 W)
Maximum current draw per DC PEM: 60 A
Maximum power consumption: 1,740

E600 Chassis

E600i
7 line card slots
Size: 16 RU, 28 h x 17.4 w x 21.45" d
(71.1 h x 44.2 w x 54.4 cm d)
Weight (factory-installed components): 81 lbs (36.7 kg)
Weight fully loaded: 242 lbs (109.8 kg)
ISO 7779 A-weighted sound pressure level:
70.42 dBA at 73.4°F (23°C)
AC Power
Nominal input voltage: 120-240 VAC 50/60 Hz
Maximum thermal output:
10,822 BTU/h (3,172 W) at 100/120 VAC
9,914 BTU/h (2,906 W) at 200/240 VAC
Maximum input current per module:
11.5 A at 100 VAC 9.6 A at 120 VAC
8.0 A at 200 VAC 6.7 A at 240 VAC
Maximum system power input:
3.5 KVA at 100/120 VAC
3.2 KVA at 200/240 VAC
Maximum power consumption:
3,422 W at 100/120 VAC
3,156 W at 200/240 VAC
DC Power
Nominal input voltage: –44 to –60 VDC
Maximum thermal output: 8,838 BTU/h (2,590 W)
Maximum current draw per DC PEM: 75 A
Maximum power consumption: 2,840 W

E1200 Chassis

E1200i-DC
14 line card slots
Size: 21 RU, 36.75 h x 17.4 w x 21" d
(93.3 h x 44.2 w x 53.3 cm d)
Weight (factory-installed components): 97 lbs (44 kg)
Weight fully loaded: 321 lbs (145.6 kg)
ISO 7779 A-weighted sound pressure level:
77.93 dBA low fan speed,
84.83 dBA maximum at 73.4°F (23°C)
DC Power
Nominal input voltage: –44 to –60 VDC
Maximum thermal output: 16,924 BTU/h (4,910 W)
Maximum current draw per DC PEM: 150 A
Maximum power consumption: 5,210 W

E1200i-AC
14 line card slots
Size: 24 RU, 42 h x 17.4 w x 22.25" d
(106.68 h x 44.20 w x 56.51 cm d)
Weight (factory-installed components):
139 lbs (63.05 kg)
Weight fully loaded: 394 lbs (178.7 kg)
ISO 7779 A-weighted sound pressure level:
77.93 dBA low fan speed,
84.83 dBA maximum at 73.4°F (23°C)
AC Power
Nominal input voltage: 200-240 VAC 50/60 Hz
Maximum thermal output: 18,710 BTU/h (5,484 W)
Maximum input current per module:
14.6 A at 200 VAC 12.2 A at 240 VAC
Maximum system power input: 5.8 KVA at 200/240 VAC
Maximum power consumption: 5,734 W at 200/240 VAC

Specifications

Common

19" front, 19" middle (optional) and 23" middle (E600/E1200 only) rack mountable
Maximum Operating Specifications:
- Temperature: 32° to 104°F (0° to 40°C)
- Altitude: no degradation to 10,000 feet (3,048 m)
- Relative humidity: 5 to 85 percent, noncondensing

Maximum Non-operating Specifications:
- Temperature: -40° to 158°F (-40° to 70°C)
- Maximum altitude: 15,000 feet (4,572 meters)
- Relative humidity: 5 to 95 percent, noncondensing

Redundancy/Availability

E1200i-DC

1+1 redundant Route Processor Modules (RPMs)
8:1 redundant Switch Fabric Modules (SFMs)
1+1 redundant DC Power Entry Modules (PEMs)

E1200i-AC

1+1 redundant RPMs
8:1 redundant SFMs
2+2 redundant AC Power Supply Modules (PSMs) – 200/240 VAC
2+1 redundant AC PSMs – 200/240 VAC

E600i

1+1 redundant RPMs
4:1 redundant SFMs
1+1 redundant DC PEMs
2+2 redundant AC PSMs – 200/240 VAC
3+1 redundant AC PSMs – 100/120 VAC and 200/240 VAC

E300

1+1 redundant RPMs
1:1 redundant SFMs
1+1 redundant DC PEMs
2+2 redundant AC PSMs – 200/240 VAC
3+1 redundant AC PSMs – 100/120 VAC and 200/240 VAC

Online insertion and removal of all components
Built-in cable management
Environmental self-monitoring

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
802.3ab	Gigabit Ethernet (1000BASE-T)
802.3ac	Frame Extensions for VLAN Tagging
802.3ad	Link Aggregation with LACP
802.3ae	10 Gigabit Ethernet (10GBASE-W, 10GBASE-X)
802.3ak	10 Gigabit Ethernet (10GBASE-CX4)
802.3i	Ethernet (10BASE-T)
802.3u	Fast Ethernet (100BASE-TX)
802.3x	Flow Control
802.3z	Gigabit Ethernet (1000BASE-X)
ANSI/TIA-1057	LLDP-MED
Force10	FRRP (Force10 Redundant Ring Protocol)
Force10	PVST+
MTU	9,252 bytes

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
3128	Tiny Fragment Attack Protection
3046	DHCP Relay Agent Information Option

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
5306	Restart Signaling for IS-IS
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
5396	4-byte ASN Representation
draft-ietf-idr-bgp4-20	BGPv4
draft-ietf-idr-restart-06	Graceful Restart

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, MLDv2 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	Management 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
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-IF-EXTENSION-MIB
FORCE10-LINKAGG-MIB
FORCE10-CHASSIS-MIB
FORCE10-COPY-CONFIG-MIB
FORCE10-MON-MIB
FORCE10-PRODUCTS-MIB
FORCE10-SMI
FORCE10-SYSTEM-COMPONENT-MIB
FORCE10-TC-MIB
FORCE10-TRAP-ALARM-MIB

Regulatory Compliance

Safety

UL/CSA 60950-1, 1st Edition
EN 60950-1, 1st Edition
IEC 60950-1, 1st Edition Including all National Deviations and Group Differences
EN 60825-1 Safety of Laser Products Part 1: Equipment Classification Requirements and User's Guide
EN 60825-2 Safety of Laser Products Part 2: Safety of Optical Fibre Communication Systems
FDA Regulation 21 CFR 1040.10 and 1040.11

Emissions

Australia/New Zealand: AS/NZS CISPR 22: 2006, Class A
Canada: ICES-003, Issue-4, Class A
Europe: EN 55022: 2006 (CISPR 22: 2006), Class A
Japan: VCCI V3/2007.04 Class A
USA: FCC CFR 47 Part 15, Subpart B, Class A

Immunity

EN 300 386 V1.3.3: 2005 EMC for Network Equipment
EN 55024: 1998 + A1: 2001 + A2: 2003
EN 61000-3-2: Harmonic Current Emissions
EN 61000-3-3:Voltage Fluctuations and Flicker
EN 61000-4-2: ESD
EN 61000-4-3: Radiated Immunity
EN 61000-4-4: EFT
EN 61000-4-5: Surge
EN 61000-4-6: Low Frequency Conducted Immunity

RoHS

All E-Series components are EU RoHS compliant.

TeraScale E-Series Switch/Routers

Highest Ethernet Density

The Force10 E-Series delivers unparalleled Gigabit Ethernet and 10 Gigabit Ethernet port densities. The E1200/E600 support 48 Gigabit Ethernet ports or 16 10 GbE ports per line card slot and up to 14 and 7 line card slots per chassis respectively. The E300 supports 48 GbE ports or eight 10 GbE port per line card slot and up to six line card slots per chassis.

Line-Rate Performance

With six custom Force10 ASICs and advanced Ternary Content Addressable Memories (TCAM) on every line card, the Force10 E-Series provides line-rate, non-blocking forwarding performance across all ports, even with all features enabled imultaneously. These features include:

- Extended ACLs for packet filtering and policy routing
- Multi-field packet lookup and classification for QoS
- Packet metering and marking for rate limiting and policing
- Congestion control using WRED and WFQ

Full L2 Switching / L3 Routing

Force10 ASICs, E-Series architecture and FTOS software work in unison to give robust L2 switching and L3 routing functionality to the E-Series with the scalability and security required for applications spanning the LAN, MAN, and Internet-connected WAN. The Force10 E-Series L2 and L3 features include:

- RIP, OSPF, IS-IS and BGP IPv4 unicast routing protocols
- PIM-SM, PIM-DM, SSM and MSDP IPv4 multicast routing protocols
- OSPF, IS-IS and BGP IPv6 unicast routing protocols
- PIM-SM, and SSM IPv6 multicast routing protocols
- Prefix-based distributed forwarding table on every line card
- Forwarding table support for up to 512K IPv4 and 32 IPv6 routes
- VLAN Redundancy, Rapid Spanning Tree, VLAN Stacking

TeraScale E-Series Capabilities	E1200	E600	E300
Switch Fabric Capacity	1.68 Tbps	900 Gbps	400 Gbps
Full-Mesh Forwarding Capacity	1 Bpps	500 Mpps	196 Mpps
Interface Support	10 GbE XFP, 1 GbE SFP, 10/100/1000 Mb Copper		
I/O Line Card Slots	14	7	6
Line-rate GbE (TeraScale)	672	336	132
Total GbE (TeraScale)	1,260	630	288
Line-rate 10 GbE (TeraScale)	56	28	12
Total 10 GbE (TeraScale)	224	112	48
Chassis Size	21 Rack Units (DC) 24 Rack Units (AC) *2 Chassis/19" Rack*	16 Rack Units *3 Chassis/19" Rack*	8 Rack Units *6 Chassis/19" Rack*
Hardware Redundancy	Power, Route Processor, Switch Fabric, Passive Copper Backplane		
Software Redundancy	L2/L3 Hitless Failover		
Operating System	Fully Modular Utilizing a 3-CPU Architecture		

Line Card Capabilities & Applications	TeraScale Series EF	TeraScale Series EG
Layer 2 Switching	✓	✓
IPv4 Routing	Aggregation, Data Center, LAN Core	Backbone, Peering, Transit
IPv6 Routing	Aggregation, Data Center, LAN Core	Backbone, Peering, Transit

FORCE10

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