

GRIDCOM DXC-H MPLS/CE PACKET TRANSPORT NETWORK



Description

GE Vernova Gridcom DXC-H provides the high availability and reliability required by carriers, power utilities, military, government, and transportation applications. It supports both MPLS-TP and Carrier Ethernet (EPL, EVPL, EPLAN, EVC defined in MEF) for packet transportation. In addition to native Ethernet transport, DXC-H can be used as the gateway for PDH and SDH/SONET networks to enter PSNs using circuit emulation and encapsulation technologies. Encapsulation technologies include TDMoE, TDMoIP, and TDMoMPLS. Circuit emulation includes CESoPSN (NxDS0/64K), SAToP (unframed E1/T1), and CEP (SDH/SONET paths). Pseudowires make grooming and multiplexing DS0, E1/T1, and SDH/SONET paths easier, and service integrity can also be monitored and protected via packet network protection schemes.

One DXC-H with core switching bandwidth up to 400Gbps supports 100GE, 40G, 10GE and 1GE along with additional time-division multiplexing (TDM) interfaces, including STM-n/OC-n, E1/T1, and a rich variety of low-speed DS0 interfaces. The system is a balanced combination of PTN/CE, SDH, and PDH technologies.

DXC-H supports MPLS-TP LSP 1:1/1+1 protection and ERPS, with protection switching time < 50ms. Ethernet, MPLS section, and end-to-end OAM are also provided for monitoring service integrity and performance. The DXC-H's powerful functions enable customers to provision a service-grooming hub, ring, or mesh packet network with ultimate ease.

Key Benefits

- **Multi-technology platform** supporting legacy, PDH, SDH, SONET, and MPLS-TP
- Very high modularity, evolutive and cost effective solution **in a single box**
- MPLS-TP and Carrier Ethernet transport capacity covering **1G, 10G, 40G and 100G transmission with low latency**
- **Centralized Network Managed System** providing complete fault, configuration, accounting, performance and security (FCAPS) system

Multiple Interface Variants

- High board density
- Conventional FXO, FXS, E&M, RS232, RS422, RS484, V.35, V.36, X.21, 64kbps, dry contact
- Dedicated for power utilities: C37.94, TDMoE, G704 Co and Contra-Directional
- PDH/SDH/SONET: E1/T1, STM1, STM4, STM16, OC-3, OC-12, OC-48, Ethernet
- Packet (MPLS-TP): 1G, 10G, 40G, 100G MPLS-TP

Advanced Features

- PoE and PoE+
- Security: MacSec (auto key rotation), LSPSec and IPSec, HTTPS, SSH, SNMPv3 and syslog

Robust & Reliable

- High level of reliability via full redundancy
- Hot swappable units eliminate the need to power down the multiplexer, minimizing traffic disruptions
- SNCP, MSP (1+1), LSP 1+1/1:1, ERPS protection network topology
- Fully compliant with international standards
- Hitless protection

Network Management

- Graphical local and remote management
- End-to-end service provisioning (TDM/MPLS-TP)
- Real-time system redundancy
- SNMP based



Customer Applications



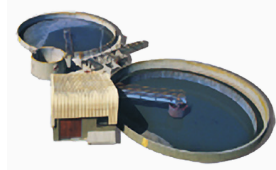
Energy

- Communication between substations, generation plants, control centers, and administration offices
- Supporting teleprotection, video surveillance, SCADA, substation automation, voice and data



Oil & Gas

- Communication between well clusters, production platforms, tank storage, and control centers
- Voice, data, CCTV, IP/Ethernet telecom services for SCADA, safety/fire, and security sub-systems



Water & Wastewater

- Communication between remote wells, dams, metering, treatment facilities, pumping/compressor stations, and control centers
- Voice, data, CCTV, IP/Ethernet, security and safety sub-systems



Transportation

- Communication for train platforms, traction power substations, wayside cabinets, maintenance facilities, and control centers
- Data, voice, transducers and contacts, IP/Ethernet

Features

Mechanical & Electrical

- 7U height, 19" width ETSI unit (front access)
- Power supply: hot swappable DC, dual for redundancy
- Operating temperature: -20 °C to 65 °C

System Capacity

- Up to 2 × 40/100GE ports
- Up to 30 × 10GE
- Up to 56 × 1GE
- Up to 100 × FE Base-T
- Up to 320 × E1/T1 ports
- Up to 160 × DS3 ports
- 68 × STM-1
- 34 × STM4 ports
- 8 × STM16 ports

MPLS-TP

- Any Ethernet port can be configured as NNI (MPLS port) or UNI (Ethernet service port)
- Bi-directional LSP
- Static LSP/PW provisioning via NMS
- Ethernet (VPWS, VPLS, H-VPLS) and TDM (CESoPSN, CEP, and SAToP) services
- MPLS-TP OAM and QoS
- TDM PW support per card:
 - 32TE1 card: Up to 256 pseudowires
 - B16 card: Up to 1024 pseudowires

Carrier Ethernet

- L2 switching/bridging
- STP, RSTP, MSTP
- Port based VLAN and port isolation
- VLAN stacking (Q-in-Q)
- CE OAM
 - CFM: Ethernet service OAM (802.1ag/Y1731)
 - EFM: Ethernet link OAM (802.3ah)
- Flow control
- Link Aggregation Control Protocol (LACP)
- Jumbo frame (MTU) = 9600
- EPL, EVPL, EP-LAN, EPV-LAN, EP-Tree
- E-Access: EPL-Access, EPVL-Access

Network Protection

- MPLS-TP
 - LSP 1+1/1:1
 - LSP E2E protection switching < 50ms
 - PW redundancy
 - Based on TP OAM for fault detection

- CE
 - ERPS ring (G.8032) protection
 - ELPS (G.8031) linear protection
- SDH/SONET
 - STM-n/OC-n MSP 1+1 protection

Management

- Fully manageable via SNMP (v1, v2, v3)
- Fully manageable via CLI
 - Serial port
 - SSH, Telnet via Ethernet
- GbE interface in-bands
- Account security
 - Two types of privileges: Operator (read only) and Administrator (read and write)
 - Radius Client and 802.1x Authentication
- Upload/Download NE configuration
- Syslog, NTP
- SNMP Port 1:1 protection
- Console 1+1 protection

TDM Pseudowire Services

- Circuit Emulation
 - DS0 (64K timeslots): CES & multiframe PW
 - Unframed E1/T1: SAToP PW
 - VC-3/4/11/12, VT-1.5/2, STS-1/3: CEP PW
- PDH Timing recovery: ACR/DCR/System
- ACR/DCR support
- SDH Circuit Emulation over Packet (CEP)
- Encapsulation
 - PW/LSP (TDM over MPLS-TP),
 - "Dry martini"; MEF 8 (TDM over Ethernet),
 - TDM over IP
- DS0 cross-connection
 - Two-way FE1(N*DS0) to FE1/VC12/STM1 cross-connection
 - Two-way FE1(N*DS0) to FE1(N*DS0) cross-connection

Ethernet Pseudowire Services

- E-Line, E-LAN, E-Tree services as defined by MEF 9 and 14 and using VPWS/VPLS
- Native Ethernet packets supported
- Encapsulation: PW/LSP (MPLS-TP), VLAN tagging (1Q), VLAN double tagging (Q-in-Q)

VPLS

- VPLS bridging
- H-VPLS bridging
- 128K MAC addresses
- 2K VPLS instances per device
- Split horizon to prevent forwarding loops

CoS/QoS

- 8 Priority Queues
- Scheduling: Strict Priority, WRR with Hierarchy
- Ingress Policing & Egress Shaping per service
- CIR / PIR (EIR) 2-rate-3-color
- MPLS: TC/EXP-Inferred-PSC (Per Hop Behavior Scheduling Class) LSP

Timing

- SSM quality level compatible
- IEEE 1588 v2 (via SyncE only)
 - PTP Clocks: Ordinary/Boundary/Transparent
 - ToD (Time of day)
 - 1-PPS (One Pulse per second) output interface
 - G.8265.1 Profile (Frequency Synchronization)
- SyncE
 - Synchronous Ethernet from all built-in and plug-in GbE, 10GbE ports
 - ITU-T Ethernet Synchronous Message Channel (ESMC)
- Stratum 3 timing
- TDM line clock: E1/T1 and STM/OC ports
- External clock input and output (2 Mbps / 2 MHz)

L3

- VRF without multicast protocols
- ARP, Ping, Trace route
- VRRP
- Static Route
- RIP v1/v2
- OSPF
- Routing among physical Ethernet ports, VLAN virtual port (VLAN routing), and PW ports.
- 32 Subinterfaces
- IGMP v2/v3
- PIM-SM
- NTP server/client

Ordering Information

Note: RoHS compliant units are identified by the letter **G** appearing at the end of the ordering code.

ORDERING CODE	DESCRIPTION
Main Unit	
GE-DXC-H-CHA-G	7U height rack chassis for DXC-H without CPU, power, connector board, fan, and plug-in cards. The chassis includes a heat buffer and cable guide on the bottom.
Connector Board	
GE-DXC-H-CBA-G	1* DB15 for TOD/PPS 1* RJ45 for CLK I/O (2*IN & 2*OUT for 2M/E1) 1* RJ45 for ALARM I/P (4 alarm Inputs) 1* RJ45 for ALARM O/P (4 alarm outputs)
CPU Module	
GE-DXC-H-CC2-G	Controller/CPU module for DXC-H chassis with RS232 console port. It supports core switching bandwidth up to 400Gbps and I/O bandwidth up to 396Gbps with full-duplex at wire-speed. This module also supports built-in line interfaces including — 2 × 100G QSFP28/40G QSFP+ ports — 5 × 10GE SFP+ ports — 8 × 1GE SFP ports

High Speed or High Density Tributary Modules

ORDERING CODE	DESCRIPTION
GE-DXC-H-GFEO-G	10 × 1G or 1 × 10G Ethernet SFP Optical Interface Card (if working in CC2/CHA slot S3~S6) 10 × FE SFP Optical Interface Card (if working in CC2/CHA slot S1, S2, S7~S10)
GE-DXC-H-XGEO-G	9 × 10G Ethernet Port SFP Optical Interface
GE-DXC-H-GFET-G	10 × 1000/100/10Mbps Ethernet Twist-Pair RJ45 if working in CC2/CHA slot S3~S6 10 × 100/10Mbps Twist-Pair RJ45 if working in CC2/CHA slot S1,S2, and S7~S10
GE-DXC-H-GFET-POEP-G	10 × 1000/100/10Mbps Ethernet Twist-Pair w/ POE+ RJ45 if working in CC2/CHA slot S3~S6 10 × 100/10Mbps Twist-Pair w/ POE+ RJ45 if working in CC2/CHA slot S1,S2, and S7~S10
GE-DXC-H-2B2G5-G	Two STM-16 or Eight STM-4 or Eight STM-1 interfaces without SFP (mini-GBIC) optical modules for operating temperature: -20°C to 65°C. It has a total card capacity of 2x STM-16/OC-48 and a total system capacity of 8 x STM-16/OC-48. The STM-n can be software configured as OC-3n for SONET application.
GE-DXC-H-1B2G5-G	If working in CC2/CHA slot S3~S6, it supports one STM-16 or four STM-4 or four STM-1 interfaces without SFP (mini-GBIC) optical module. If working in CC2/CHA slot S1~S2 or S7~S10, it supports one STM-4 or four STM-1 interfaces without SFP (mini-GBIC) optical module.
GE-DXC-H-EoS-G	Ethernet over SDH/SONET with 1 x STM-16/1 x OC-48 worth traffic over CEM. Operating temperature: -10 °C to 55 °C. The STM-n can be software configured as OC-3n for SONET application.
GE-DXC-H-16TE1-G	16-port E1 (120 ohm) or 16-port T1 software programmable module with SCSI interfaces
GE-DXC-H-32TE1-G	32-port E1(120 ohm) or 32-port T1 software programmable plug-in module with SCSI interfaces

Low Speed Tributary Modules

ORDERING CODE	DESCRIPTION
GE-DXC-H-12FXOA-G	12-channel FXOA plug-in card with 600/900 Impedance, Battery Reverse and Loop Start. Without Ground Start and Metering Pulse. Used with 12 RJ11.
GE-DXC-H-12FXSA-GMP-G	12-channel FXSA plug-in card with 600/900 Impedance, Battery Reverse, Loop Start, PLAR, [PLAR bit programmable], [Ground Start] and [Metering Pulse]. Used with 12 RJ11.
GE-DXC-H-4E1-G	4-channel E1 plug-in card
GE-DXC-H-4T1-G	4-channel T1 plug-in card
GE-DXC-H-6UDTEA-G	6-port universal data interface card that supports three software configurable modes: Port 1 to 4: two DB44 connectors Port 5 to 6: two RJ48 connectors Mode 1: Port 1 to 4: RS232/RS422/X.21, Async/Sync 64kbps and subrate with V.110 encoding Port 5 to 6: RS232 for ASYNC only Mode 2: Port 1 to 4: X.21/RS422 SYNC N*64k (N=1~32) Port 5 to 6: Disabled Mode 3: Port 1 to 3: X.21/RS422 SYNC N*64k, (N=1~32). Port 4: X.21/RS422 SYNC, N*64k, (N=1~20). Port 5 to 6: RS232 N*64k (N=1~6) oversampling for ASYNC data. Mode 4: Port 1 to 4: RS232/RS422/X.21/V.35/V.36/EIA530 SYNC 38.4K and subrate Port 5 to 6: Disabled Mode 5: Port 1 to 4: X.21/RS449/RS422/RS232/V.35/V.36/EIA530 SYNC N*64k (N=1~32) Port 5 to 6: Disabled
GE-DXC-H-8RS232-RJ-G	8-port RS232 plug-in card with X.50 subrate multiplexing scheme and X.54 encoding, with 8 RJ48 connectors for 8 RS232 Async ports
GE-DXC-H-8RS232-DB-G	8-port RS232 plug-in card with X.50 subrate multiplexing scheme and X.54 encoding, with 2 RJ48 connectors and 2 DB44 connectors for Async and Sync ports
GE-DXC-H-8DC-G	8-channel dry contact type A plug-in card with maximum voltage 100 Vdc or 250 Vac
GE-DXC-H-8DCB-G	8-channel dry contact type B plug-in card with maximum voltage 220 Vdc or 250 Vac
GE-DXC-H-4C37-G	4-channel C37.94 plug-in card
GE-DXC-H-RTB-G	8-LAN port/64 WAN ports router/bridge plug-in card
GE-DXC-H-8EMA-G	8 channel 2W/4W E&MA plug-in card. Used with 8 RJ45 connectors or 1 Telco 64 connector.
GE-DXC-H-6CDA-G	6-channel G.703 Interface at 64 Kbps data rate. Per port configurable for Co-directional or Contra-directional interfaces.

Mini Plug-in Modules (Select 1 to 6 cards from list below)

ORDERING CODE	DESCRIPTION
GE-DXC-H-S1T1-G	1-channel T1 interface card
GE-DXC-H-S1E75-G	1-channel of E1plug-in card w/ 75 ohm
GE-DXC-H-S1E120-G	1-channel of E1 plug-in card w/ 120 ohm
GE-DXC-H-SM4T1-G	Mini Quad T1 plug-in card
GE-DXC-H-SM4E75-G	Mini Quad E1 plug-in card with 75 ohm
GE-DXC-H-SM4E120-G	Mini Quad E1 plug-in card with 120 ohm
GE-DXC-H-SFOM-opt-G	Fiber Optical plug-in card
GE-DXC-H-S1V35-G	1-channel V.35 plug-in card
GE-DXC-H-S1X21-G	1-channel X.21 plug-in card
GE-DXC-H-S1RS232-G	1-channel RS232 plug-in card
GE-DXC-H-S1ODP	1 port OCU DP Interface card
GE-DXC-H-SQEMA-wr-m-Tn-x-G	Jumper selectable: 2/4 WIRE; A/B side Quad E&M voice card, complied with IEEE1613 standard.
GE-DXC-H-SQFXOA-x-G	Quad FXO voice plug-in card used with 4 RJ11
GE-DXC-H-SQFXOA-GS-x-G	Quad FXO with GS plug-in card used with 4 RJ11
GE-DXC-H-SQFXSA-x-pt-G	Quad FXSA voice plug-in card
GE-DXC-H-SQFXSA-M-x-pt-G	Quad FXSA with MP 16 KHz voice plug-in card
GE-DXC-H-SQFXSA-M12-x-pt-G	Quad FXSA with MP 12 KHz voice plug-in card used
GE-DXC-H-SQFXSA-GS-x-pt-G	Quad FXSA with GS plug-in card
GE-DXC-H-SQFXSA-GM-x-pt-G	Quad FXSA with GS and MP 16 KHz voice plug-in card
GE-DXC-H-SQMAGA-G	Quad channel magneto plug-in card
Data Processing	
GE-DXC-H-SECA-G	Echo canceller card
GE-DXC-H-SABRA-G	Analog Bridge Card for DXC-H
GE-DXC-H-SRTA-G	2-LAN ports/64 WAN port router/bridge plug-in card
GE-DXC-H-SM1C37-LSFOM-G	1- channel C37.94 plug-in mini card
GE-DXC-H-SDPA-G	Single -48 Vdc (-36 to 75 Vdc) power module
Fan Module	
GE-DXC-H-FANA-G	FAN module for chassis cooling

Standard Compliance

RFC (IETF)

1042	Standard for the Transmission of IP Datagrams over IEEE 802 Networks	4448	Encapsulation Methods for Transport of Ethernet over MPLS Use over an MPLS PSN
1305	Network Time Protocol (NTP) Version 3	4553	SAToP (Structured Agnostic TDM over Packet Switched Networks) Networks
2236	Internet Group Management Protocol, Version 2	4664	Framework for L2VPNs (VPLS/VPWS)
2273	SNMPv3 Applications	4665	Service Requirements for Layer 2 Provider-Provisioned Virtual Private Networks (QoS)
2328	OSPF Version 2	4842	Considerations for a Transport Profile
2453	RIP Version 2	5085	Pseudowire Virtual Circuit Connectivity Verification (VCCV)
2571	An Architecture for Describing SNMP Management Frameworks	5086	CESoPSN
2572	Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)	5254	Requirements for Multi-Segment PWE3
2573	SNMP Applications		RFC (IETF)
2737	Entity MIB (Management Information Base) (Version 2)	5317	Multiprotocol Label Switching (MPLS) MPLS Generic Associated Channel
2865	Remote Authentication Dial-In User Service (RADIUS)	5462	MPLS Label Stack Entry
3031	Multiprotocol Label Switching Architecture	5586	MPLS Generic Associated Channel
3032	MPLS Label Stack Encoding	5601	Pseudowire (PW) Management Information Base (MIB)
3270	MPLS Support of differentiated Services	5602	PW over MPLS PSN MIB
3376	Internet Group Management Protocol, Version 3	5603	Ethernet PW MIB
3410	Introduction and Applicability Statements for Internet Standard Management Framework	5654	Requirements OAM for MPLS-TP
3411	An Architecture for Describing SNMP Management Frameworks	5659	An Architecture for Multi-Segment PWE3
3412	Message Processing and Dispatching	5710	Path Error Message Triggered MPLS and GMPLS LSP Reroutes
3413	SNMP Applications	5718	An In-band Data Communication Network for MPLS-TP
3414	User-based Security Model	5798	Virtual Router Redundancy Protocol VRRP Version 3 for IPv4 & IPv6
3415	View-based Access Control Model	5860	Requirements for OAM in MPLS-TP
3417	Transport Mappings for the SNMP	5880	Bidirectional Forwarding Detection (BFD)
3418	Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)	5882	Generic Application of Bidirectional Forwarding Detection
3768	Virtual Router Redundancy Protocol VRRPv2	5884	BFD for MPLS Label Switched Paths
3811	Definitions of Textual Conventions (TCs) for MPLS Management	5885	BFD for the Pseudowire VCCV
3812	MPLS Traffic Engineering (TE) Management Information Base (MIB)	5920	Security Framework for MPLS and GMPLS Networks
3813	MPLS Label Switching Router (LSR) Management Information Base (MIB)	5921	A Framework of MPLS in Transport Network
3826	The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model	5950	MPLS-TP Network Management Framework
3985	Pseudo Wire Emulation Edge-to-Edge Architecture	5951	Network Management Requirements for MPLS-TP
4115	A Differentiated Service Two-Rate, Three-Color Marker with Efficient Handling of in-Profile Traffic	5960	MPLS-TP Data Plane Architecture
4379	Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures	6215	MPLS-TP User-to-Network and Network-to-Network Interfaces
4385	Pseudowire Emulation Edge to Edge (PWE3)	6370	MPLS Transport Profile(MPLS-TP) Identifier
		6371	OAM Framework for MPLS-Based Transport Networks
		6372	MPLS-TP Survivability Framework
		6373	MPLS-TP Control Plane Framework

6374	Packet Loss and Delay Measurement for MPLS Networks	IEEE	
6375	A Packet Loss and Delay Measurement Profile for MPLS-Based Transport Networks	802.1d	STP
6378	MPLS-TP Linear Protection	802.1p	Traffic Prioritization
6426	On demand connectivity verification	802.1w	RSTP
6427	MPLS Fault Management OAM	802.1s	MSTP
6428	Proactive connectivity verification	802.1q	VLAN
6478	Pseudowire Status for Static Pseudowire	802.1ab	Local and metropolitan area networks - Station and Media Access Control Connectivity Discovery
6639	MPLS-TP MIB-Based Management Overview	802.1ad	VLAN Tag Stacking (Q-in-Q)
6669	Overview of the OAM toolset for MPLS- Based Transport Networks	802.1ag	Ethernet OAM (CFM)
6941	MPLS Transport Profile (MPLS-TP) Security Framework	802.1X	Local and Metropolitan Area Networks: Port-based
7213	MPLS Transport Profile (MPLS-TP) Next-Hop Ethernet Addressing	802.3	Carrier Sense Multiple Access with Collision Detection
7276	An Overview of OAM	802.3ab	Gigabit Ethernet over copper
7331	Bidirectional Forwarding Detection (BFD) Management Information Base (MIB)	802.3ad	Link Aggregation Control Protocol
826	Address Resolution Protocol (ARP)	802.3ae	10 Gigabit Ethernet
854	MIL STD 1782 Telnet Protocol Specification	802.3ah	Ethernet in the First Mile (EFM)
		802.3u	Type 100BASE-T MAC parameters, Physical Layer, MAUs, and Repeater for 100 Mb/s Operation
ITU-T		802.3x	Flow Control
G.8031	ELPS	802.3z	Gigabit Ethernet Standard over fiber (1000Base-SX/LX)
G.8032	ERPS	1588 v2	Precision Time Protocol (PTP)
G.8101	Terms and Definitions for MPLS Transport Profile	1613	Environmental and Testing Requirements for communication Networking Devices installed in electric power substations
G.811	Timing characteristics of primary reference clocks		
G.8110.1	Architecture of MPLS-TP Layer Network Interfaces for the MPLS-TP Transport Profile layer Network		
G.8112	MPLS-TP OAM		
G.8113.2	Characteristics of MPLS-TP Network Equipment Functional Blocks		
G.8121	Characteristics of MPLS-TP equipment functional blocks supporting ITU-T G.8113.2/Y.1372.2		
G.8121.2	MPLS-TP Linear Protection		
G.8131	Management aspects of the MPLS-TP network element		
G.8151	Time and phase synchronization aspects of packet networks		
G.8271	Timing characteristics of a synchronous Ethernet equipment slave clock		
G.8262	Timing and synchronization aspects in packet networks		
G.8261	Ethernet OAM		
Y.1731	Operations, administration and maintenance (OAM) functions and mechanisms for Ethernet-based networks		

EMC/EMI

FCC15 Class A
EN 55032 Class A/EN 55035
EN 50121-4
IEC 61850-3
ANSI C63.4a-2017
ETSI EN 300386
ETSI ES 201468
ETSI EN 300 019-1-1, 1-2, 1-3, 2-1, 2-2, 2-3
IEC 61000-4-3
IEC 61000-4-4
IEC 61000-4-6
IEC 60068-2-1
IEC 60068-2-3
IEC 60068-2-52
IEC 60068-2-64

Safety

EN62368-1

MEF

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MEF Carrier Ethernet (CE) 2.0 compliant for EPL (Ethernet Private Line), EVPL (Ethernet Virtual Private Line), EP-LAN (Ethernet Private LAN) , EVP-LAN (Ethernet Virtual Private LAN), EP-Tree (Ethernet Private Tree) and EVP-Tree (Ethernet Virtual Private Tree)

Environmental Protection Standards

2011/65/EU & (EU)2015/863
2012/19/EU (WEEE)

For more information, visit
governova.com/grid-solutions

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