CiTRANS 690E

1 Quick Overview of Product

CiTRANS 690E series product is the large-capacity sliced and packetized intelligent transmission device launched by FiberHome Telecommunication Technologies Co., Ltd. (hereinafter referred to as "FiberHome Telecommunication") for metropolitan transport network. The external view, positioning, features and architecture of this series are introduced below.

1.1 Product Profile

With the large-scale deployment of LTE/5 G network and the advancing of full-service development strategy, various emerging IP-based service applications have ever-growing requirements for the bandwidth, scheduling flexibility and service quality of the carrying network. Therefore, CiTRANS 690E series of SPN transmission devices are developed at the demand.

This series of products have the capabilities of Ethernet packet switching and SE-XC switching, which can not only flexibly schedule packet services, but also provide hard pipeline isolation and bandwidth guarantee for services through SE-XC switching, thus meeting the high-quality carrying requirements of mobile fronthaul / middlehaul / backhaul, enterprise dedicated line / dedicated network, home broadband and other services.

This series includes three products: CiTRANS 690E10, CiTRANS 690E20 and CiTRANS 690E30.

Their external views are shown in Figure1-1, Figure 1-2 and Figure 1-3 respectively.

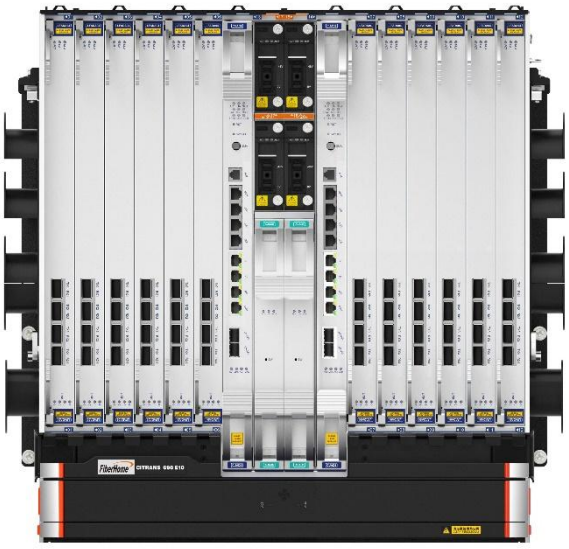

Figure 1-1 External view of CiTRANS 690E10

Figure 1-2 External view of CiTRANS 690E20

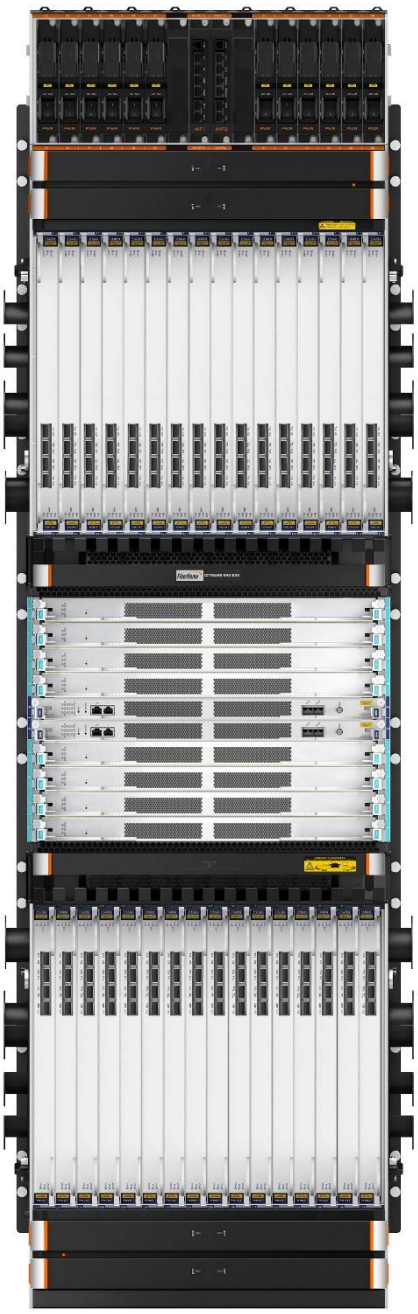

Figure 1-3 External view of CiTRANS 690E30

1.2 Product Positioning

CiTRANS 690E series products are developed as MTN transmission devices. CiTRANS 690E10/E20 is mainly used in metropolitan aggregation layer, CiTRANS 690E30 is mainly used in metropolitan core layer or provincial / national backbone layer. This series of products and CiTRANS650 products in metropolitan access layer consist of networking to provide end-to-end multi-service carrying.

The application of the series in network is as shown in Figure 1-4.

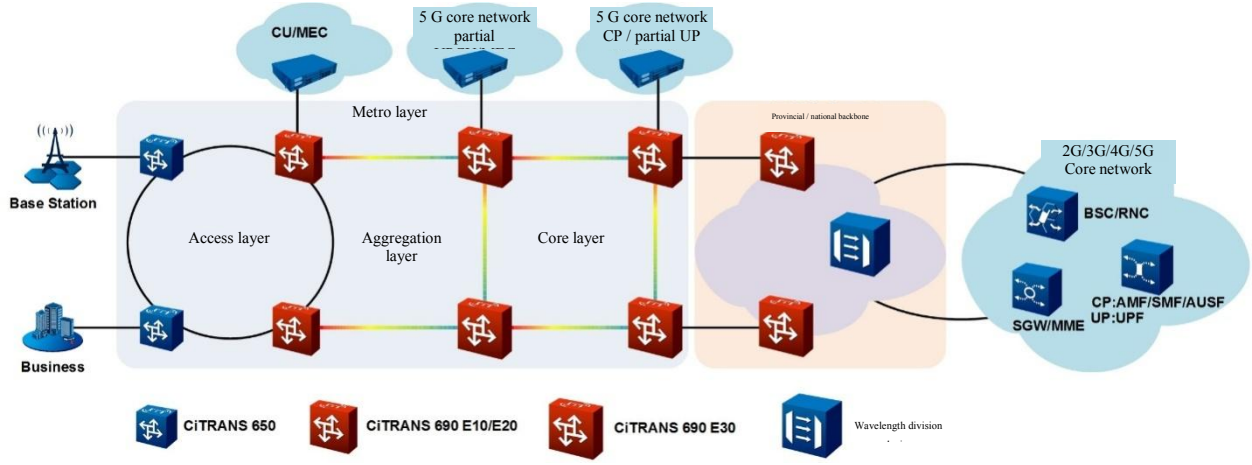

Figure 1-4 Network application of CiTRANS 690E series products

1.3 Product Features

CiTRANS 690E series products can support a variety of business types, have powerful processing capabilities, and have rich features to ensure the transmission quality and efficiency of various services of users. The features of CiTRANS 690E series products are introduced below.

1.3.1 Powerful processing capacity

Switching Capacity

CiTRANS 690E series products support SE crossover and packet switching capabilities.

Packet switching capability and SE crossover capability of the three models of products CiTRANS 690E10, CiTRANS 690E20 and CiTRANS 690E30 are shown in Table 1-1.

TABLE 1-1 Packet Switching Capability and SE Crossover Capability

Product model	Packet Switching	SE Crossover Capability -	SE Crossover Capability -
CiTRANS690E10	12T	9.6T	128*5G
CiTRANS690E20	28.8T	19.2T	128*5G
CiTRANS690E30	38.4T	25.6T	128*5G

Access capability

CiTRANS 690E series products provide users with powerful Ethernet access capability. Access capability is shown in Table 1-2.

Table 1-2 Ethernet Access Capability of CiTRANS 690E Series Products

Product series	Interface type	Chassis name	Chassis access capacity	Whole unit access
CiTRANS690E10	GE	GSADA16	16	16×12
	10GE	XSADA16	16	16×12
		TFADA16	16	16×12
	25GE	TFADA16	16	16×12
	50GMTN	LFADA02	2	2×12
		LFADA04	4	4×12
		LFADA08	8	8×12
	100GMTN	HFADA02	2	2×12
		HFADA04	4	4×12
	200GMTN	CFADA01	1	1×12
		CFADA02	2	2×12
		CFADB02	2	2×12
CiTRANS690E20	GE	GSADA16	16	16×24
	10GE	XSADA16	16	16×24
		TFADA16	16	16×24
	25GE	TFADA16	16	16×24
	50GMTN	LFADA02	2	2×24
		LFADA04	4	4×24
		LFADA08	8	8×24
	100GMTN	HFADA02	2	2×24
		HFADA04	4	4×24
	200GMTN	CFADA01	1	1×24
		CFADA02	2	2×24
		CFADB02	2	2×24
CiTRANS690E30	GE	GSADA16	16	16×32
	10GE	XSADA16	16	16×32
		TFADA16	16	16×32

Table 1-2 Ethernet Access Capability of CiTRANS 690 E Series Products (Continued)

Product series	Interface type	Chassis name	Chassis access capacity	Whole unit access
	25GE	TFADA16	16	16×32
	50GMTN	LFADA02	2	2×32
		LFADA04	4	4×32
		LFADA08	8	8×32
	100GMTN	HFADA02	2	2×32
		HFADA04	4	4×32
	200GMTN	CFADA01	1	1×32
		CFADA02	2	2×32
		CFADB02	2	2×32

1.3.2 Multiple interface types

CiTRANS 690E series products provide various types of interfaces to achieve the access of a variety of types of services, administration and maintenance of network elements, input and output of clock / time information.

Service interface

Interface type	Description
GE interface	Optical interface: 1000BASE-LX, 1000BASE-EX, 1000BASE-ZX1, 1000BASE-ZX2, 1000BASE-ZX, 1000BASE-SR
10 GE interface	Optical interface: 10 GBASE-LR, 10 GBASE-ER, 10 GBASE-ZR, 10
25 GE interface	Optical interface: 25 GBASE-LR
50 GE interface	Optical interface: 50 GBASE-LR, 50 GBASE-ER, 50 GBASE-ZR
100 GE interface	Optical interface: 100 GBASE-LR4, 100 GBASE-ER4, 100 GBASE-ZR4
200 GE interface	Optical interface: 200 GBASE-LR4, 200 GBASE-ER4, 200 GCFP2-DCO

Management / auxiliary interface

Interface type	Interface Name	Description
Auxiliary interface	f	Debugging interface
	COM/COM1/COM2	Software debugging interface
Management interface	ALM	Subframe alarm output interface
	ALMI/ALMO	Subframe alarm cascade interface
	F1/F2/SIG	Network administration interface
	MON	DC switching value input interface for external

Interface type	Interface Name	Description
	CTR	DC switching value output interface for external

Clock / time interface

Interface type	Interface Name	Description
External clock interface	CLK/CLK1/CLK2	Used for clock synchronization (i.e. frequency and phase synchronization), access or
External time interface	ToD、1PPS/ToD1、1PPS/ToD2、SMA、HP-GE1、	Used for time synchronization, access or output time signals

1.3.3 Rich business types

CiTRANS 690E series products support L2VPN and L3VPN services, as shown in Table 1-3.

Table 1-3 Supported business types

Business	Service type		Description
L2VPN service	E-Line	EPL (port-based)	Point-to-point Ethernet emulation service, i.e. VPWS service end scheduled tasks on a local or remote
		EVPL (VLAN-based)	
	E-LAN	EP-LAN (port-based)	Multipoint-to-multipoint Ethernet emulation service, i.e. VPLS service.
		EVP-LAN (VLAN-based)	
	E-Tree	EP-Tree (port-based)	
		EVP-Tree (VLAN-based)	
L3VPN service	MPLS L3VPN/HoVPN		Support static L3VPN service.
L2/L3VPN service .	1:1 bridged L2/L3VPN service		L2VPN accesses L3VPN service by bridging, i.e. L2/L3 bridging service.
	N:1 (N=1 - 4094) bridged L2/L3VPN Business		

1.3.4 Perfect QoS mechanism.

CiTRANS 690E series products provide hierarchical end-to-end QoS administration, and can provide differentiated and refined transmission services based on flow for each user group, each user, and each user business at different levels.

- Support DiffServ mode based on traffic classification, completely realize PHB defined in the standard, enable network operators to provide users with service guarantee at different quality service levels, and realize an integrated network carrying data, voice and video services.
- Provide end-to-end QoS for services.
    - 4 The device supports HQoS mechanism to control the total bandwidth of a single service type, a single service access point, multiple service access points, a single service or multiple services respectively.
    - 4 The device supports TE mechanism on the network side to balance network traffic and ensure service quality.

QoS can not increase bandwidth, but it can minimize network delay and jitter and ensure the quality of key services through reasonable allocation and monitoring of network resources.

1.3.5 Efficient carrying technology

CiTRANS 690E series products use tunnels to carry all kinds of services, make full use of network resources to realize the efficient transmission of all kinds of services.

The tunnel carrying technologies supported by the CiTRANS 690 E series products are shown in Table 1-4.

Table 1-4 Tunneling

Carrying technology	Description
MPLS-tunnel	MPLSLSP is used to carry all kinds of services.
SR-TP	Segment routing based on traffic engineering transports subsets.
SR-BE	Segment routing based on best-effort forwarding.
MTNChannel	Support the flexible creation of MTNChannel with N*5 G/10M granularity
DWDM	Support output colored light interface.

1.3.6 Perfect protection

CiTRANS 690E series products support carrier class protection features, including device-level protection and network-level protection.

Device-level protection feature

The device-level protection features of the CiTRANS 690E series products are shown in Table 1-5.

Table 1-5 Device-level protection feature

Objects of protection	Protection Mode
CUAD1、CUAD2、CUAD6	1:1 protection of main control unit
XUAD4、XUAD5、XUAD6	M+N protection of unified cell cross control unit
TSUAD1	1+1 protection of TSUAD1 disk
PWR	Redundancy protection of power plate
PDP1063A	1+1 protection of external input power supply
FAN	Intelligent protection of fan unit

Network-level protection features

The network-level protection features of CiTRANS 690E series products are shown in Table 1-6.

Table 1-6 Network-level protection features

Objects of protection	Protection Mode
Ethernet link (UNI/NNI side)	LAG group protection in
Cross-device link in dual-return landing scenario	MC-LAG protection of cross-device link aggregation
Tunnel	LSP 1:1 protection
PW	PW redundancy
Multi-point fault protection of	WrappingV4
LTE service, L2VPN service	Dual-return protection: PW redundancy + BypassPW
L3VPN service network side	VPNFRR+LSP1:1
L3VPN service user side protection	IPFRR
	IP and VPN combined FRR
MTNChannel	Unidirectional / bidirectional 1+1 path protection
SR-TP tunnel	SR-TP 1:1 protection SR-TP 1:1 protection + rerouting
SR-BE tunnel	TI-LFA protection
Single-point and multi-point fault	ECMP protection in IPECMP, VPNECMP and SR-TPECMP

1.3.7 Precise synchronization

CiTRANS 690E series products support various clock / time synchronization functions, providing precise clock / time synchronization for services with synchronization requirements to ensure lossless transmission of services.

Clock synchronization capability

Physical layer clock synchronization mechanism is a technology that extracts clock information from the signals of physical channels of transmission links to complete frequency synchronization. Ethernet synchronization is a kind of Ethernet physical layer clock synchronization technology, which directly extracts the clock from the serial code traffic on the Ethernet line and use the clock to send data to realize clock synchronization.

CiTRANS 690E series products supports the recovery of clock information from the following transmission links:

- Support 64-channel Ethernet synchronization interface to recover clock.
- Support 2048 kbit/s or 2048 kHz external timing input and 2048kbit/s or 2048kHz external timing output clock.

CiTRANS 690E series products support three clock modes: tracking, holding and free oscillation to process and transmit SSM.

Time synchronization capability

- u traditional Ethernet interface synchronization

  4 Support processing of the message defined by PTP1588v2 through Ethernet ports such as GE, 10 GE, 25 GE, 50 GE and 100 GE;

  4 Support OC and BC clock models.
- uMTN interface synchronization

  4 Support MTN port to process the message defined by PTP protocol. The message format, processing, clock model, OAM, synchronization precision, etc. of PTP protocol are the same as those of traditional Ethernet interface;

  4. Support carrying PTP messages through MTNGroup link layer overhead;
- u time interface synchronization

  4 Support 1PPS time output interface, and the physical interface type is SMA;

  4 Support dedicated GE optical synchronization interface;

  4 Support 1PPS+ToD time input / output interface, and the physical interface type is RJ45.

1.3.8 Hierarchical operation and maintenance

OAM, namely, the Operation, Administration and Maintenance, which is to complete daily network and service analysis, prediction, testing, fault administration and other operational activities. MTN network adopts layered OAM architecture, which can be divided into sliced transport layer / access link layer OAM, sliced channel layer OAM, sliced packet layer OAM and customer service layer OAM.

OAM functions supported by CiTRANS 690E series are shown in Table 1-7.

Table 1-7 OAM Functions

Network	OAM type	OAM technology	STDS.
Sliced transport layer / access Link access	Physical link, MTN interface, UNI sub-interface	BFD BFDonLAGIEEE802.3ahOAM	RFC588 0RFC7130
Sliced channel layer	MTNSection layer MTNPath layer	MTNSection layer OAM	OIF-FLEXE-2.0OIF-
Sliced packet layer	MPLS-TPSection	VSOAM	ITU-TG.8113.1
	MPLS looped network	MPLS looped network	ITU-TG.8113.1
	MPLS-TP Tunnel、SR-TP Tunnel	VPOAM	ITU-TG.8113.1
	PW	VCOAM	ITU-TG.8113.1
Customer service layer	L2VPN	IEEE802.1agOAM ITU-TY.1731OAM	IEEE802.1ag ITU-TY.1731
	L3VPN	Ping、Traceroute	RFC792 RFC4861
Customer service layer In-BandOAM	L3VPN	In-Band OAM/In-situOAM(iOAM)	IETF draft-brockners-inband-oam-requirements-

1.3.9 Green energy-saving design

CiTRANS 690E series products adopt green energy-saving design, which is featured with great reduction of device energy consumption, high efficiency, environmental protection and low operation cost.

Intelligent fan

CiTRANS 690E series products support heat dissipation features of smart fan:

- The fan unit works at the speed gear set by the network administration, and the optional gears include: full speed, high speed, medium high speed, medium speed, medium-low speed, low speed and ultra-low speed.
- The fan unit automatically adjusts the fan speed according to the temperature fed back by each chassis of the device.

Energy conservation and emissions reduction

CiTRANS 690E series products have energy saving and emission reduction features:

- Reduce power consumption by improving chip technology;
- Choose high-efficiency secondary power supply module;
- 10 G optical module is fully SFP;
- Improve the integration level of chassis and reduce the single bit power consumption.