

# FLASHWAVE® 5310

## Ethernet Services Platform



*The FLASHWAVE 5310 Ethernet Services Platform is a compact, multiservice, carrier-grade platform that delivers both Ethernet and TDM-based connectivity in enterprise business and mobile backhaul service applications. This platform offers a small form factor, temperature resilience, and low power consumption. It is ready to be installed at wireless towers or customer premises to solve space and power challenges, deliver high-performance scalable services and reduce operational costs.*

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## Ethernet Services Platform

### Standards-Based Carrier Ethernet Delivery

Designed to support both MEF and SONET/SDH industry standards, the FLASHWAVE 5310 platform delivers Ethernet Private Line (EPL), Ethernet Virtual Private Line (EVPL) and Ethernet LAN-based connectivity for high-capacity business and 4G mobile backhaul services. The platform also provides T1/E1 circuit emulation and SONET/SDH channelized OC-3/STM-1 connectivity for leased-line replacement and 2G/3G mobile backhaul services. With dedicated hardware for 1588v2 clock recovery, the FLASHWAVE 5310 platform provides 1 Pulse Per Second (PPS) and Time of Day (ToD) GPS Minimum Recommended Data sentence (GPRMC) outputs for phase and clock synchronization.

This platform's integrated support for both Ethernet and TDM connectivity create an affordable, versatile and seamless path to high-performance Ethernet WAN and wireless 3G/4G mobile backhaul services. The FLASHWAVE 5310 platform has two bays for access modules and three available access module types:

- 8 x E1/T1 CES Module
- 4 x GbE Modules
- 1 x OC-3/STM-1 CES Module

#### Service-Level Provisioning, Monitoring and Management

Network management is provided through graphical user interfaces based on SNMP, supported by in-band or out-of-band interface options and by the NETSMART® 1200 system, a full-featured network management system. The management view ranges from the individual node to an end-to-end network- and service-centric view.

#### Dedicated Performance Monitoring Hardware

The FLASHWAVE 5310 platform features dedicated hardware for traffic performance monitoring, enabling it to address today's requirement for hardware-based Y.1731 latency, jitter and frame-loss ratio measurements. Hardware-based MAC address swapping on the FLASHWAVE 5310 system enables station loopbacks to allow centralized test sets to complete service turn-up and performance verification. Tiered Ethernet services as well as wireless backhaul service-level performance may also be monitored through the Web-based SLA portal.

#### Scalable, Flexible and Reliable Platform for Ethernet Service Delivery

The FLASHWAVE 5310 platform is engineered with service module and SFP port flexibility. The platform provides Ethernet service scalability from 1 Mbps to 1 Gbps, and 1 to 16 T1/E1s, offering an integrated, flexible combination of Ethernet and TDM services. High reliability is provided for Ethernet services with G.8032v2 sub-50 ms ring protection, ladder rings, and multiple instances. Carrier-class TDM services can depend on sub-50 ms protection with SONET/SDH-based APS on OC-3/STM-1 channelized ports.

#### Key Benefits

- Compact, low power, temperature-resilient platform
- Ready for tower or customer premises deployment
- Delivers high performance and reduces operational cost
- An affordable and seamless path to high-capacity business Ethernet and wireless 4G services
- Multiservice TDM and Ethernet support

#### Key Features

- Synchronization source derived from any of:
  - SyncE Ethernet interfaces
  - BITS in
  - Any SONET/SDH interface
  - Any T1/E1 interface
  - Embedded 1588v2 slave clock (available with additional RTU)
- System clock meets the specifications required for Stratum 3 timing (ANSI T1.101)
- Carrier-grade platform with hot-swappable power (x2) and fans, low-latency, and highly reliable service delivery with 50 ms ring protection G.8032v2 and SONET/SDH-based APS
- Deep fault and performance management with Y.1731, loopback, link trace, delay, jitter and loss measurement
- Customer SLA portal access.

## Key Applications

### Applications

The FLASHWAVE 5310 Ethernet Services Platform is designed for three key applications:

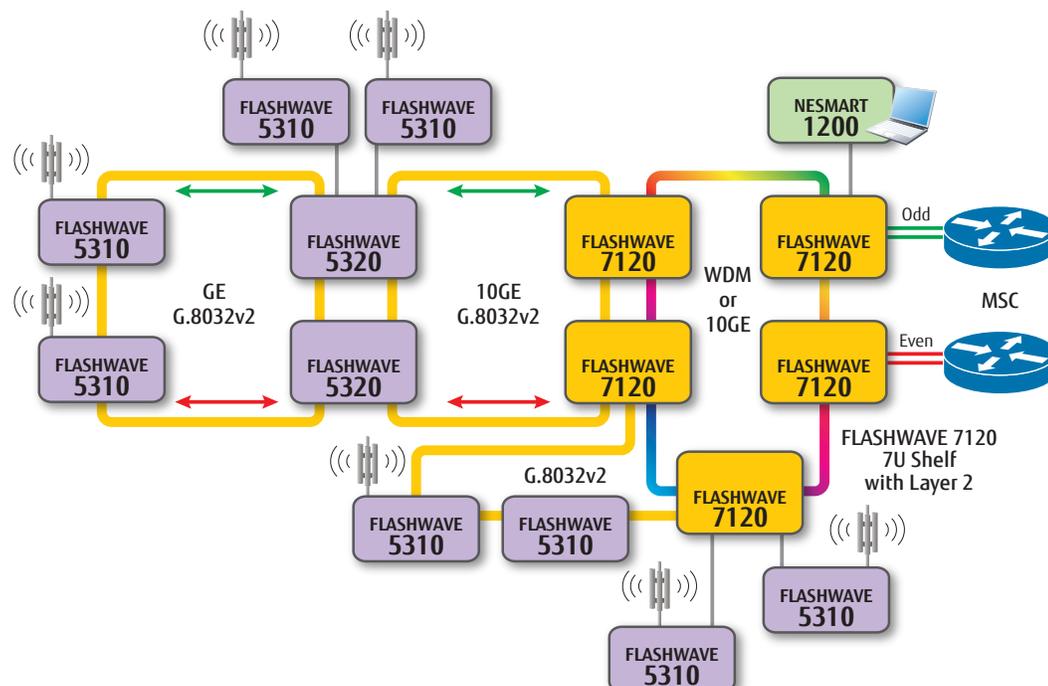
- Mobile backhaul
- Enterprise service delivery
- Access infrastructure

### Mobile Backhaul

Mobile backhaul is an excellent application for the FLASHWAVE 5310 system. The platform makes optimal use of underutilized bandwidth, maximizes throughput, and makes the fullest use of fiber assets. The enhanced traffic management capabilities enable consistently optimal performance in complex, high-traffic networks during peak traffic times. The platform also offers guaranteed minimal bandwidth support, while dynamically allocating individual EVCs to peak rates. Optional sub-50 ms network resiliency (via G.8032), offers selective service protection. The FLASHWAVE 5310 device is the high-performance cell tower access platform solution for “five nines” carrier-class backhauling of 4G LTE services.

Mobile backhaul is experiencing an explosion in traffic bandwidth demand. Wireless operators are moving from leased lines to dark fiber as part of their solution and must leverage wavelengths to secure their investment for future expansion at minimal additional cost. The solution to their backhaul needs includes the FLASHWAVE 5310, FLASHWAVE 5320 and FLASHWAVE 7120 platforms, as shown in the diagram below. This combination delivers redundancy at all critical points in addition to other benefits:

- Wavelength-based scalability
- Even (green)/odd(orange) traffic replication
- Ring-based service aggregation with redundant E-Line EVCs per cell site
- Throughput turn-up testing
- Y.1731 performance monitoring
- End-to-end service protection



# FLASHWAVE® 5310

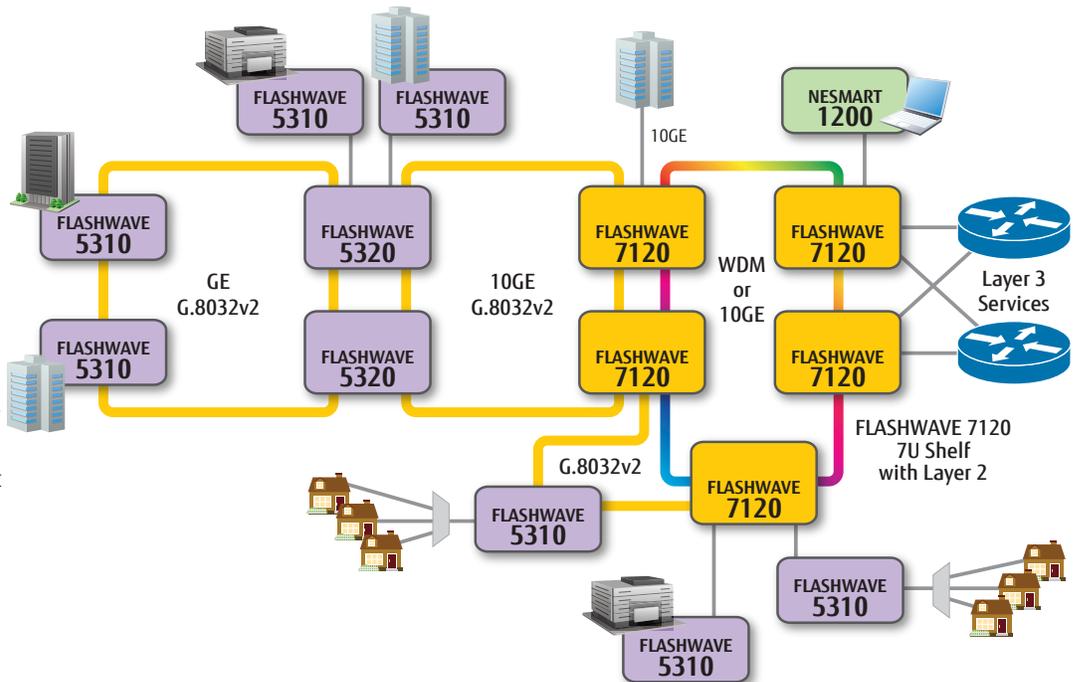
## Ethernet Services Platform

### Key Applications

#### Enterprise Service Delivery

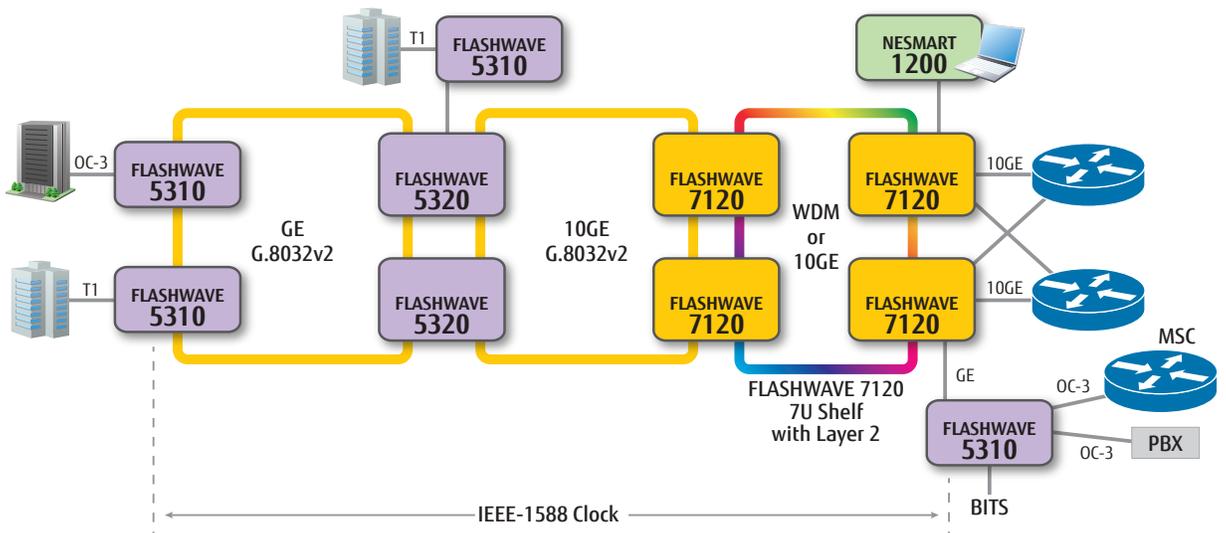
The FLASHWAVE 5310 system is the ideal access and aggregation solution for delivering Ethernet business services. High-density Ethernet service interfaces allow large numbers of data customers to be supported on a single system. Integrated traffic management, data aggregation, E-Line, and E-LAN technologies provide robust, carrier-grade data services with guaranteed SLAs.

Some businesses require relatively small flows (10 to 100 MBps), which can use a switched Ethernet access network for economical transport. Other businesses, however, require the entire 1 GbE and need it completely intact, including the framing bits (transparent). Both customer types can use the FLASHWAVE 5310 platform for further aggregation before handing off higher end interfaces.



#### T1/E1 and OC-3/STM-1 Circuit Emulated Service Delivery

The FLASHWAVE 5310 system is capable of delivering T1 and OC-3 TDM business services for applications such as PBX systems or backhauling TDM radios over Ethernet infrastructure. The 8 x T1/E1 or 2 x OC3/STM-1 modules allow a FLASHWAVE 5310 to forward Ethernet as well as T1/E1 or OC-3/STM-1 from the same device. Aggregation of T1s from multiple locations into a single OC-3 is also supported.



## Network Services

Fujitsu offers a broad selection of services for every stage in a network's evolution and operation. From planning through deployment and ongoing maintenance to future enhancements, Fujitsu Network Services are available whenever needed. Fujitsu sales representatives can guide service providers in selecting options that address individual business needs.

Popular planning and deployment services for the FLASHWAVE 5310 platform include:

- Custom Cabinet Solutions – Turnkey inside wall-mount and outside-plant solutions, including standard and custom configurations for wireline, wireless, FTTx, cable and MSO customers
- Furnish Material – Identification and ordering of the material needed to install network equipment such as electrical and fiber cable solutions, minor materials and third-party ancillary equipment
- Turn-Up and Test – From on-site configuration and simple turn-up to rigorous, long-term testing

### Network Operations

Network operations are a large part of the expense of a network. The design, implementation, and maintenance of a network all play a part in this operational expense. The NETSMART 1200 system is an excellent tool as it streamlines the process of deploying and maintaining an Ethernet network. The FLASHWAVE 5310 platform is fully supported by NETSMART 1200. Of particular interest is that

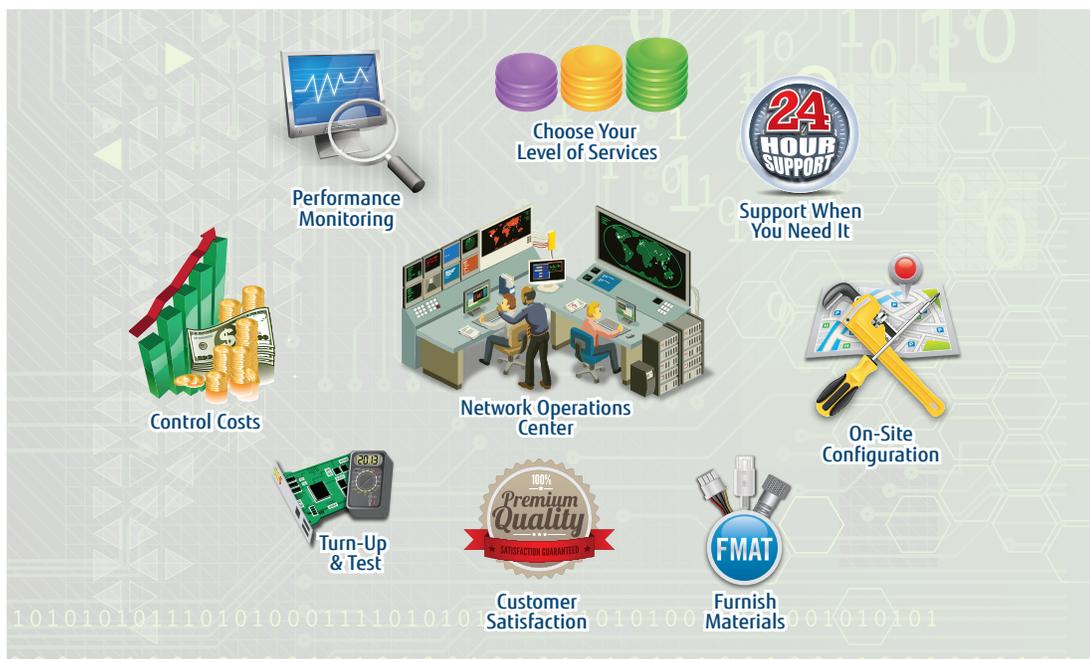
NETSMART 1200 system provides for an MEF approach to operations. It uses MEF terms and concepts for provisioning and allocating resources, which greatly simplifies the operational aspect. It determines flows based on the CIR/CBS/EIR/EBS and reduces the complexity and the need to know all of the complex intricacies of the systems. It makes Ethernet provisioning simple and easy. The NETSMART 1200 tool also covers all of the network functions including WDM and Ethernet.

### Maintenance and Support Program

For a complete professional maintenance solution, the Fujitsu Maintenance and Support Program has the right combination of flexibility and comprehensive assurance. Choose the level and types of service you need to supplement your own resources. The Maintenance and Support Program helps keep your network running smoothly, provides critical care and protects the longevity of your investment.

### Managed Network Solutions

With a full range of vendor-independent network fault and performance monitoring features, the Fujitsu Managed Network Solutions offer guaranteed, round-the-clock system protection. Our reliable NOC facility is available as a primary or supplemental operations resource. This service not only helps you control costs and maintain high levels of customer satisfaction, it also provides trustworthy and reliable after-hours and emergency monitoring.



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## Ethernet Services Platform

### Features and Specifications

Base System Hardware	
Modularity	<ul style="list-style-type: none"> <li>Hot-swappable power supply</li> <li>Hot-swappable fan unit</li> <li>2 service module slots</li> </ul>
Size 1RU (H x W x D)	1.7 x 17.1 x 10" (44 x 435 x 255 mm)
Weight (base unit)	7.7 lbs (3.5 kg)
Ethernet Ports	<ul style="list-style-type: none"> <li>4x FE/GE SFP ports</li> <li>ITU-T G.8262</li> <li>ITU-T G.781 Option 1 SSM QL</li> <li>SyncE in/out</li> </ul>
System Clock	<ul style="list-style-type: none"> <li>Stratum 3 ANSI T1.101</li> <li>G.813</li> <li>BITS in/out, SMB connector</li> <li>1PPS share with BITS IN</li> <li>Time of day out via serial port</li> <li>1588v2 traceable to PTP</li> <li>SyncE, line timing, BITS in, ACR and 1588v2</li> </ul>
Clock Sources	Best Master Clock
Ethernet Switching	
Switching Fabric	32 Gbps
Packets per Second	18 Mpps
MAC Address Table	<ul style="list-style-type: none"> <li>32 K table entries</li> <li>Enable/disable learning per port</li> </ul>
Jumbo Frames	9600 Bytes
VLAN Tagging 802.1Q	4094 C-VLANs
Provider Bridging 802.1ad	4094 S-VLANs
Tagging	<ul style="list-style-type: none"> <li>CVLAN translation</li> <li>Double tagging</li> <li>Tagging, de-tagging, swapping</li> <li>Virtual untagged</li> </ul>
Traffic QoS	
Priority Queues	8 queues per port
Traffic Classification	802.1P, port, VLAN, ToS, DSCP
Bandwidth Meters	<ul style="list-style-type: none"> <li>CIR/CBS and PIR/PBS</li> <li>2-rate 3-color (2R3C)</li> <li>Bandwidth profiles</li> <li>Ingress and egress filters</li> <li>Per service in 1 Mbps increments</li> </ul>

Ethernet OAM	
Fault Management	<ul style="list-style-type: none"> <li>802.1ag CFM, Y.1731</li> <li>802.3ah EFM dying gasp</li> <li>Loopback and link trace</li> <li>Ethernet fault propagation shutdown</li> </ul>
Loopbacks	<ul style="list-style-type: none"> <li>Station Loopback</li> <li>Loopback based on L2 and L3 Filter</li> <li>MAC address swap for RFC 2544</li> </ul>
Topology Discovery	LLDP
Ethernet Services	
	<ul style="list-style-type: none"> <li>E-LINE and E-LAN</li> <li>MEF Abstraction Layer</li> </ul>
Network Protection	
Ethernet Ring Protection Switching	<ul style="list-style-type: none"> <li>&lt;50 ms protection switching</li> <li>3.3ms CCMs in hardware</li> <li>Non-revertive/revertive</li> <li>ITU-T G.8032v2</li> <li>Multiple instances/laddered rings</li> </ul>
Link Aggregation	1:1 LAG with LACP (802.3ad)
Security	<ul style="list-style-type: none"> <li>Access control list</li> <li>Port mirroring</li> <li>Storm control</li> </ul>
Management	
	<ul style="list-style-type: none"> <li>SNMPv2C and MIB-II</li> <li>Private and public MIBs</li> <li>FTP, SFTP, Telnet and SSH</li> <li>In-band and out-of-band</li> <li>RADIUS</li> </ul>
Performance Monitoring	
Bin Frequency	24 hr, 15 min and 5 min PM bins
Ethernet SLA PMs	<ul style="list-style-type: none"> <li>Y.1731 Frame Delay</li> <li>Y.1731 Delay Variation</li> <li>Y.1731 Loss Ratio</li> <li>Throughput measurement</li> </ul>
Ethernet Port PMs	<ul style="list-style-type: none"> <li>Rx, Tx and error statistics</li> <li>Input and output rate per port</li> <li>Input and output utilization per port</li> </ul>
TDM	<ul style="list-style-type: none"> <li>PMs: ES, SES and UAS</li> <li>Alarms: AIS, RAI, LOS and LOF</li> <li>Terminal and remote loopback</li> </ul>

## Features and Specifications

### Circuit Emulation

T1/E1 & OC-3/STM-1 Module	<ul style="list-style-type: none"> <li>• Internal system clock</li> <li>• Adaptive clock recovery</li> <li>• Up to 8 ACR clock domains</li> <li>• 2 ms to 32 ms PDV buffers</li> <li>• SAToP and CESoPSN (T1/E1 only)</li> <li>• MPLS, MPLS dry Martini</li> <li>• MEF8 and IPv4+UDP</li> </ul>
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### Service Modules

T1/E1 Module	<ul style="list-style-type: none"> <li>• 8-port RJ-48C</li> <li>• ITU-T G.8261, G.823, G.824</li> <li>• E1 balanced 120 Ω, T1 balanced 100 Ω</li> </ul>
OC-3/STM-1 Module	<ul style="list-style-type: none"> <li>• 2x SFP connector</li> <li>• Active standby</li> <li>• T1/E1 channelized – 84 x DS1/63 x E1</li> </ul>
Ethernet Module	<ul style="list-style-type: none"> <li>• 4 x FE/GE SFP</li> <li>• SyncE out</li> </ul>

### Operation

Operating Temperature	–40 to 149 °F (–40°C to +65 °C)
Short Term Temperature	–49 to 185 °F (–45°C to +85 °C)
Humidity	Up to 90% non-condensing
Power Supply	<ul style="list-style-type: none"> <li>• Redundant power supply</li> <li>• DC: +24 V DC (+19 to +30 V DC)</li> <li>• DC: –48 V DC (–40 to –62 V DC)</li> <li>• AC: 120 V</li> </ul>
Nominal/Maximum Power	30 W/50 W
Fan Unit	<ul style="list-style-type: none"> <li>• Hot-swappable fan unit</li> <li>• 3 fans alarm monitored</li> </ul>

### Regulatory

- CSA/UL & CE mark
- NEBS Level 1 & NEBS Level 3
- ROHS 5/6



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