The FLASHWAVE® 5300 family offers compact, carrier-grade devices that deliver Ethernet connectivity services in enterprise business and mobile backhaul applications. Small form factor, low power consumption, and temperature-hardened architecture make these devices ideal for wireless towers, customer premises, and aggregation points.
Designed to support Metro Ethernet standards, the FLASHWAVE 5300 family delivers Ethernet Private Line (EPL), Ethernet Virtual Private Line (EVPL) and Ethernet LAN connectivity in ring or star topologies, for high-capacity business and mobile backhaul 4G applications. With dedicated hardware for IEEE 1588 v2 clock recovery, these platforms provide 1 Pulse per Second (PPS) and Time of Day (ToD) GPS Minimum Recommended Data sentence (GPRMC) outputs for phase and clock synchronization.

The FLASHWAVE 5300 devices solve space and power challenges, deliver high performance scalable services and reduce operational costs. Integrated support for both GbE and 10 GbE Ethernet connectivity creates an affordable, versatile and seamless path to high-performance Ethernet WAN and wireless 3G/4G mobile backhaul services.

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

Graphical user interfaces based on Simple Network Management Protocol (SNMP) supported by in-band or out-of-band interface options, together with the NETSMART® 1200 management system, provide a full network management view. The NETSMART 1200 system streamlines the process of deploying and maintaining an Ethernet network. The system provides for a Metro Ethernet Forum (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, greatly simplifying the provisioning process.

With dedicated traffic performance monitoring hardware, the FLASHWAVE 5300 family provides hardware-based ITU-T Y.1731 latency, jitter and frame-loss ratio measurements. Hardware-based Media Access Control (MAC) address swapping enables support for station loopbacks, allowing centralized test sets to complete service turn-up and performance verification. Tiered Ethernet services as well as service level performance for wireless backhaul may also be monitored through the Web-based SLA portal.
High Performance and Reliability, Low Operating Costs

Ethernet Services Solutions for Key Business Challenges

- Expanding capacity and footprint
- Modernizing to support new technologies and service types
- Reducing Capex and Opex
- Supporting redundancy and protection
- Implementing service-level assurance and SLA compliance
- Speeding up service delivery and turn-up

Scalable, Flexible and Reliable Services Platform

Architected in small, portable form factors with at least 4 SFP ports, the FLASHWAVE 5300 series platforms provide Ethernet service scalability from 1 Mbps to 10 Gbps. With SFP+ ports supporting both GbE and 10 GbE SFPs, these platforms offer flexible demand service delivery and high reliability for Ethernet services with ITU-T G.8032 v2 sub-50 millisecond ring protection, laddered rings, and multiple instances.

The FLASHWAVE 5300 platforms provide Ethernet service demarcation, classification, traffic management, prioritization, aggregation, and service interworking in up to 40 Gbps switching fabrics. High reliability is provided for Ethernet services with ITU-T G.8032 v2.

Key Features

- Compact, energy-efficient, temperature-resilient units ready for tower or customer premises deployment
- Affordable and seamless path to high-capacity business Ethernet and wireless 4G services
- Flexible service demand delivery
- Ability to migrate from 1 to 10 GbE via an SFP change without changing the platform
- Synchronization source derived from SyncE Ethernet interfaces or ITU-T 1588 v2 slave clock
- System clock meets the accuracy, stability, and holdover specifications required for stratum 3 timing (G.813)
- Carrier-grade platform with low latency, and highly reliable service delivery with sub-50 millisecond ring protection (ITU-T G.8032 v2)
- Standards-based and interoperable with MEF Carrier Ethernet 2.0
- Fault and performance management with ITU-T Y.1731 and Y.1564 loopback, link trace, delay, jitter and loss measurement

Ethernet Interfaces

<table>
<thead>
<tr>
<th>FLASHWAVE 5300 Family Port Capacity Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLASHWAVE 5305: 4 ports x 1 GbE/10 GbE SFP+</td>
</tr>
<tr>
<td>FLASHWAVE 5321: 24 ports x 1 GbE SFP and 4 ports x 1 GbE/10 GbE SFP+</td>
</tr>
<tr>
<td>FLASHWAVE 5322: 12 ports x 1 GbE/10 GbE SFP+</td>
</tr>
</tbody>
</table>
Applications
The FLASHWAVE 5300 family of platforms were specifically designed for mobile backhaul, enterprise service delivery, and similar access infrastructure applications.

Mobile Backhaul
The FLASHWAVE 5300 series is ideally suited to the demands of mobile backhaul. Its reuse of underutilized bandwidth maximizes throughput and makes the fullest possible use of fiber assets. Its enhanced traffic management enables consistently optimal performance in complex, high-traffic networks during peak times. This series also offers guaranteed minimal bandwidth support, while dynamically allocating individual EVCs to peak rates. Optional sub-50 millisecond network resiliency, using ITU-T G.8032, offers selective service protection. These platforms offer an ideal 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 5300 family of Ethernet access platforms in combination with the FLASHWAVE 7120 Micro Packet Optical Networking Platform.

Enterprise Service Delivery
The FLASHWAVE 5300 family 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 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 economic transport. On the other hand, other businesses require the entire 1 GbE completely intact, including the framing bits (transparent). Both of these customers can use these systems for further aggregation before handing off higher-end interfaces. For future-proof demand growth, a FLASHWAVE 5300 system to grow from 1 GbE to 10 GbE simply by changing out appropriate SFPs.
## Features and Specifications

### Base System Hardware

| Ethernet Interfaces | FLASHWAVE 5305: 4 ports x 1 GbE/10 GbE SFP+  
|                     | FLASHWAVE 5321: 24 ports x 1 GbE SFP and  
|                     | 4 ports x 1 GbE/10 GbE SFP+  
|                     | FLASHWAVE 5322: 12 ports x 1 GbE/10 GbE SFP+  
| Serial Port         | RJ-45 RS-232 Serial Port  
| Local LAN Port      | 10/100 Mbps Ethernet RJ-45  
| Front LEDs          | • RED: Critical, Major and Minor  
|                     | • Blue: Run  
| Fan                 | FLASHWAVE 5305: No  
|                     | FLASHWAVE 5321: Field-swappable  
|                     | FLASHWAVE 5322: Field-swappable  
| Power supply connectors | • Terminal block for –48 VDC+/24 VDC  
|                     | • AC via 12 V adapter  
| BITS-OUT            | SMA Connector  
|                     | 10 MHz input & 1PPS output  

### Ethernet Switching

| Switching Fabric | 40 Gbps  
| MAC Address Table | 32 K Table Entries  
| Jumbo Frames | 9600 Bytes  
| VLAN Tagging 802.1Q | 4094 C-VLANs  
| Provider Bridging 802.1ad | 4094 S-VLANs  
| Tagging | CVLAN Translation & Double Tagging  
|         | Tagging, De-tagging, Swapping  

### Synchronization

* ITU-T G.8261/G.8262/G.8264 SyncE on all interfaces  
* SyncE status message support  
* IEEE 1588 v2 ordinary clock (slave only)  
* Internal Stratum-3 Clock with holdover to meet ITU-T G.813

### Ethernet Services

| MEF CE2.0 Carrier Ethernet E-Line, E-LAN & E-Access*  
| Traffic Management | Push, Pop and Swap  
| Priority Queues | 8 queues per port  
| Traffic Classification | 802.1P, Port, VLAN, ToS, DSCP  
| MEF Compliant Policer | CIR/CBS and PRI/PBS  
|                     | 2-rate 3-color (TRTCM)  
| Supports large CBS up to 32768 KB to guarantee SLA performance levels on bursts of frames which exceed the CIR  
| MEF 23.1 HBWF (Hierarchical Bandwidth Profile)  
| Hierarchical QoS for 3-stage shaping and 2-stage scheduling

### Network Protection

| Ethernet Ring Protection Switching | • <50 ms Protection Switching  
|                                  | • 3.3 ms CCMs in hardware  
|                                  | • Non Revertive/Reversible  
|                                  | • ITU-T G.8031/G.8032 v2  
|                                  | • Multiple Instances/Laddered Rings  
| Link Aggregation | 0:N LAG with LACP (802.3ad)  
| 1:1 Active/Standby LAG

### Ethernet OAM

| Fault Management | • 802.1ag CFM  
|                  | • 802.3ah EFM with Dying Gasp  
|                  | • Y.1731 FM and PM  
|                  | • RFC2544 Test Generator & Analyzer  
|                  | • Y.1564 Multi-Service Activation test  
|                  | • TWAMP (Two Way Active Measurement Protocol)  
| Loopbacks | • Station Loopback:  
|           | • Layer 1, 2 (MAC Swap)  
|           | • Layer 3 (IP Swap)  
|           | • Layer 4 (TCP/UDP Port Swap)  
|           | • Loopback based on Layer 2 and Layer 3 Filter  
|           | • Station Loopback via inband requests  
|           | • IEEE 802.1ah / Y.1731 LBM OAM LBK

### Topology Discovery

| Link Layer Discovery Protocol

### Performance Monitoring

| Ethernet SLA PMs | • 24 hr, 15 min and 5 min bins for PMs  
|                  | • Y.1731 Frame Delay  
|                  | • Y.1731 Loss Ratio  
|                  | • Y.1731 Delay Variation  
|                  | • One-Way Delay using IEEE 1588 v2 PTP  
| Ethernet Service PMs | • 24 hr, 15 min and 5 min bins for PMs  
|                     | • Bytes declared Red, Yellow and Green  
|                     | • Packets Received and Transmitted  
|                     | • Input & Output Rate per EVC  
|                     | • Service Utilization per CIR

| Ethernet Port PMs | • 24 hr, 15 min and 5 min bins for PMs  
|                   | • Rx, Tx and Error Statistics  
|                   | • Input and Output Utilization per Port

*Available in R1.2  
† MEF certification upcoming
# FLASHWAVE® 5300
## Ethernet Access and Aggregation Devices

## Features and Specifications

### Security
- Telnet with SSH v2
- Remote Authentication via RADIUS
- Access Control List (ACL)
- IEEE 802.1x Port Authentication

### Management
- SNMP v1/v2c Sets and Gets
- FTP, SFTP
- In-band and Out-of-band

### Physical Characteristics

<table>
<thead>
<tr>
<th>Dimensions (HxWxD)</th>
<th>FLASHWAVE 5305: 1.73 x 7.32 x 7.32” 44 x 186 x 187 mm</th>
<th>FLASHWAVE 5321: 1.73 x 17.32 x 9.44” 44 x 440 x 240 mm</th>
<th>FLASHWAVE 5322: 1.73 x 17.32 x 9.44” 44 x 440 x 240 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>FLASHWAVE 5305: 3.1 lbs (1.4 kg)</td>
<td>FLASHWAVE 5321: 5.3 lbs (2.4 kg)</td>
<td>FLASHWAVE 5322: 5.3 lbs (2.4 kg)</td>
</tr>
</tbody>
</table>

### Operation
- Operating Temperature: –40°C to +65°C
- Storage Temperature: –40°C to +70°C
- Humidity: Up to 85% non-condensing

### Power Supply
- FLASHWAVE 5305: AC: via 12 VAC Adapter
- DC: –48 VDC/+24 VDC

### Power Redundancy
- Redundant Feeds DC Power Supply
- Single AC Power Supply

### Nominal/Maximum Power
- 20 W/30 W

### Regulatory
- FCC Part 15 Class A
- EN 55022, EN 55024 Class A
- UL 60950-1, IEC 60950-1, EN 61000
- NEBS Level 3 compliant
- GR-63-CORE Issue 3 & GR-1089-CORE Issue 5
- CSA & CE Mark

### Compliance
- RoHS 5/6: Compliance with Directive 2002/95/EC 6
- ETSI 300 019 Class 1-1, Class 2-32, Class 3-1

### Standards Compliance
- IEEE 802.1Q, 802.1ag, 802.1ad (LLDP) and 802.1x
- ITU-T Y.1731, G.8032 v2, G.8261/8262/8264*
- CE 2.0, MEF 6.1, 9, 10.2, 11, 14, 20, 23.1, 25, 26.1, 30, 33 & 35
- IETF RFC2544, RFC5357, RFC2863 (IF-MIB)*
- IETF RFC3418 (MIB for SNMP), RFC4188 (Bridge)
- IETF RFC2922 (Physical Topology)

*Available in R1.2