Falcon-MX/G

Transport Enabled Grandmaster Clock

Product Overview

The **Falcon-MX/G** is a high performance, Edge Grandmaster/GW Clock, with service aggregation and demarcation capabilities, delivering high end Timing coupled with Carrier Ethernet services.

This product extensively supports the evolving needs for Timing and Synchronization in a constantly growing number of applications. Geared with integrated GNSS receiver, highly accurate timestamping engines and dedicated packet generators and responders, it delivers consistent and robust high performance.

The **Falcon-MX/G** supports the Precision Time Protocol (PTP, IEEE1588v2), Synchronous Ethernet (SyncE) and NTP packet-based timing services. These are coupled with a market leading variety of interfaces, including 10/100/1000BaseT and 100/1000/2500M/10G optical interfaces (supporting all common types of SFPs). These provide unparalleled flexibility in deployment and connectivity.

All Ethernet interfaces of the system can be used for Carrier Ethernet services delivery, for aggregation or demarcation. This is performed in parallel to all timing functions, with no performance degradation.

The **Falcon-MX/G** can support numerous applications requiring timing. The most common one being mobile backhaul and fronthaul, for LTE/5G, both macro sites and small cells.

The **Falcon-MX/G**'s extensible hybrid (ASIC-FPGA) Hardware architecture allows for ultimate flexibility and performance.

The **Falcon-MX/G**'s capacity for Ethernet services delivery, including MEF standards is based on a highly advanced timing aware, switching core.

The **Falcon-MX/G** fully supports O-RAN LLS-C1 through C4 configuration including the forwarding of C/U-plane eCPRI packets and S/M planes for management and synchronization.

- 10G service aggregation/demarcation unit for business Ethernet and mobile xHaul
- Extensive Sync and Timing options with GNSS, SyncE, PTP (including GM), BITS, etc.
- Based on 3rd generation Falcon platform with 160Gbps throughput
- Support O-RAN configurations LLS-C1/C2/C3/C4
- Complete OAM toolbox for OPEX reduction (802.1ag, Y.1731, RFC2544, Y.1564)
- Advanced QoS and service level traffic management
- Advanced high speed protection mechanisms for link, path, and ring service resilience
- Full set of MEF CE2.0 compliant services
- Compact design, with low power consumption

Quality of Service (QoS) features including classification and mapping based on layer 1 through layer 4 attributes, rate limiting per service, with highly flexible scheduling, queuing and shaping options (including HQoS).

All MEF defined services (EPL, EVPL, ELAN, etc) can be configured on the **Falcon-MX/G** series and can also be protected through use of high-performance mechanisms, based on G.8031, G.8032, etc., for link, path, and ring resilience.

The system implements current OAM standards (802.3ah, 802.1ag, Y.1731with HW assist as well as proactive measurements and alarming facilities.

To complete its toolbox, the **Falcon-MX/G** has a variety of OAM functions (such as Y.1731), a built-in packet generator and analyzer to implement (RFC2544/Y.1564) for quick service turn-up and verification.

The **Falcon-MX/G** is housed in a compact, 19", 1RU chassis, featuring hot-swappable, load-sharing, redundant power supply design, wide range AC or DC power options.

Technical Specifications

Interfaces & Indicators

- Ethernet:
  - 24 x 100/1000BaseX (SFP)
  - 4 x 10/100/1000BaseT (RJ45)
  - 4 x 1/2.5/10G (SFP+)
  - Supported SFP/SFP+: MM,SM,SFS, xWDM, Copper
  - All optical ports support PTP, SyncE and NTP
- Sync:
  - ToD/1PPS (RJ45)
  - 2 x 1PPS/10MHz (SMA)
  - BITS (RJ48)
  - GNSS antenna in (SMA, active, 5VDC)
- 1x USB and 1x RJ45 Console
- LEDs:
  - Power (per PS)
  - CPU, alarm
  - Link/Activity (per port)
  - Aux. module
    (Rubidium, Processing engine for SDN/NFV, etc.)

IEEE1588/PTP

- Functions:
  - Grandmaster (PRTC-A)
  - Boundary Clock (Class C/D)
  - Ordinary Clock (M/S)
  - Transparent Clock (Class C/D)
- Profiles supported:
  - Telecom Frequency (G.8265.1)
  - Telecom Phase (G.8275.1, G.8275.2)
  - Default (1588)
  - AVB (802.1AS)
  - Power Profile * (C37.238)
  - Custom
- Modes supported:
  - 1 and 2 step
  - L2 Multicast
  - L3/UDP Unicast/Multicast
  - Mixed transport modes
  - E2E and P2P delay
  - VLAN tagging
- Slave capacity:
  - Up to 128 Unicast @ full packet-rate unicast
- Support for max packet rates for:
  - Announce, Sync, Del_Req and Del_Resp messages

Other Timing Services/Features

- Physical interfaces:
  - 2 x SMA connectors
  - User configurable for 1PPS/10MHz input/output
  - ToD/1PPS (NMEA) input and output
  - 5VDC GNSS input (active antenna)
- Built-in Stratum 3 clock
- NTP:
  - Server (Future upgradable to HW based)
  - Client
- Support O-RAN configurations LLS-C1/C2/C3/C4
- Synchronous Ethernet (SyncE):
  - G.8261, G.8262
  - ESMC (G.8264)
- GNSS:
  - 32 channels
  - Multi-constellation:
    GPS, GLONASS, Galileo, Beidou, QZSS
- BITS:
  - Input and output
  - E1 (2.048Mbps) and T1 (1.544Mbps)
- 2.048MHz
- SyncCenter
- SyncController
  - PTP Slave mode

Architecture & Forwarding

- Hybrid (ASIC-FPGA) HW architecture
- 256MB RAM, 256MB flash memory
- L2 forwarding (802.1D MAC bridging)
- Flow-based forwarding
- Performance: wire-speed, on all ports, all frame sizes
- Switching fabric: 160Gbps, non-blocking
- MTU: 10K bytes
- MAC table: 32K addresses
- VLANs: 4K concurrent
- Provider bridging: 802.1ad (Q-in-Q)
- Private VLANS
- L1-L4 ACLs
- Multicast:
  - IGMPv3 snooping
  - MLD snooping
  - Up to 8K MC groups
- Layer 3:
  - Static routes
  - IPv4/IPv6
  - DHCP (client, server, relay)

(*) roadmap

Quality of Service

- Classification based on L1-L4 information
- Ingress policing per flow (MEF BW profiles)
- Two rate, 3-color marking
- Hierarchical queuing/scheduling
- Hierarchical shaping
- Priority based flow control (802.1Qbb)
- Scheduling: Strict and DWRR (WFQ equivalent)
- 4 drop precedence levels w/WRED and tail drop for CA
- P-bit and DSCP remarking
- Storm control: UC, MC, BC
- QoS Control Lists
- Compliant with 3GPP QoS requirements for LTE backhaul

Protection

- Link aggregation: Static and LACP
- Loop protection
- Linear protection: G.8031
- Ring protection: G.8032v2
- Spanning tree: STP, RSTP, MSTP

OAM & Diagnostics

- IEEE802.3ah link OAM
- IEEE802.1ag CFM (HW assisted)
- ITU-T Y.1731 PM (HW assisted)
- RFC2544 traffic generator & analyzer (wire speed)
- Y.1564 traffic generator & analyzer (wire speed)
- L2 loopbacks w/ MAC swap
- Throughput metering
- SFP diagnostics (SFF-8472)
- Traffic mirroring and remote mirroring
- sFlow

Management

- Interfaces:
  - CLI: Console (RS232), Telnet, SSH1/2
  - SNMP: v1/v2c/v3, extensive MIBs, trap profiles
  - Web: HTTP/HTTPS
  - Management VLAN
  - IPv6 management
- Authentication:
  - RADIUS, TACACS+
  - Multiple local users
  - User access levels (15)
  - Management ACLs
  - 802.1x (port/MAC based)
- Link discovery: LLDP, CDP snooping
- Operations:
  - Remote System Update (TFTP or Web)
  - Configuration upload/download (TFTP or Web)
  - Text based config files
- Alarms:
  - SNMP traps
  - Syslog (internal and remote server)
  - CLI events
- Remote temperature reading & alarm
- Per port and CoS detailed statistics
- RMON Statistics, History, Alarm and Event

Power & Environmental

- Dual, redundant, hot swappable power supplies
- AC/DC: 100-240VAC, 50/60Hz or 125VDC
- DC: 20-60VDC, ST connector
- Power consumption:
  - Maximum: <60W; typical: <50W
- Operating temperature:
  - Standard: -10°C ÷ +50°C (14°F ÷ 122°F)
  - Extended: -40°C ÷ +65°C (-40°F ÷ 149°F) (optional)
- Storage temperature: -40°C ÷ +70°C (-40°F ÷ 158°F)
- Humidity: 10-90%, non-condensing

Physical

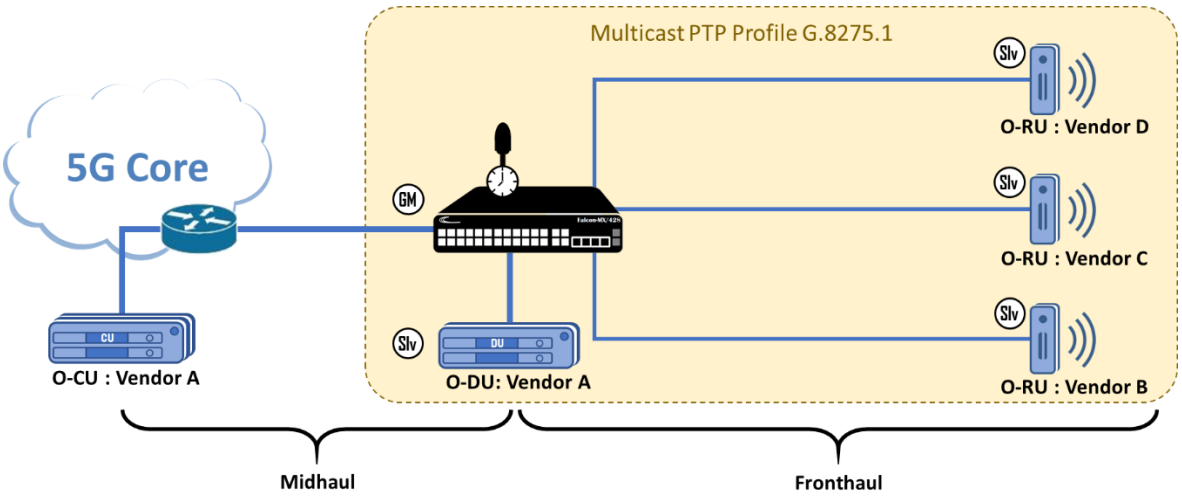
- Dimensions (HxWxD):
  - 44x440x244mm (1.73x17.33x9.60 inch)
- Mounting:
  - Desktop
  - Rack
  - Wall
- Weight: ~ 3.3Kg (6.6 lb)
- Accessories:
  - Power cable
  - RS232 cable (console)
  - Rack mounting kit

Regulatory & Compliance

- Safety:
  - IEC EN60950-1
- CE
- RoHS
- EMC:
  - FCC CFR 47 part 15, subpart B, Class A
  - EN 300 386 V1.3.3: 05
- MEF: CE2.0

Fibrolan Datasheet

5G Fronthaul Sync & Transport Application



Ordering Information

Model	P/N	Description
Falcon-MX/428/G/A	7122	Access Service Aggregator, 24x100/1000BaseX (SFP), 4x10/100/1000BaseT, 4x10GE (SFP+), advanced timing spec (w/ GNSS), 1 removable AC power supply (FPS10012/A), CE SW license
Falcon-MX/428/G/D	7123	Access Service Aggregator, 24x100/1000BaseX (SFP), 4x10/100/1000BaseT, 4x10GE (SFP+), advanced timing spec (w/ GNSS), 1 removable DC power supply (FPS10012/D), CE SW license
RBCM-2	7111	Rubidium Atomic Clock Module, type 2
FPS10012/A	7106	Redundant power supply, AC/DC (100-240VAC/125VDC), 50 to 60Hz, 100W
FPS10012/D	7107	Redundant power supply, DC (20-60V), 100W

Specifications are subject to change w/o prior notice

We've got Timing for you!

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