µFalcon-ST/G

Multiservice & Synchronization System

- Advanced Edge Synchronization Master and Carrier Ethernet system delivering business-class Ethernet, legacy TDM services, timing and mobile backhaul over fiber infrastructure
- Comprehensive timing and synchronization features, including GNSS receiver, IEEE1588v2, SyncE, external frequency/phase and BITS
- Integrated NTP client and server
- Flexible configurations for timing distribution over physical and logical interfaces
- MEF certified, supporting Ethernet Private Line (EPL) and Ethernet Virtual Private Line (EVPL) services with flexible mapping of the user traffic into Ethernet flows
- Circuit Emulation Services (SAToP, CESoPSN, MEF8) with flexible and advanced synchronization options, including SyncE, 1588v2 (OC, TC and BC), external clock and integrated GPS receiver
- Complete Ethernet OAM toolbox based on IEEE 802.1ag, ITU-T Y.1731, RFC2544 and Y.1564 for Opex reduction
- Unique Micro-burst detection (MBD) technology for microsecond granular SLA monitoring (patent pending)

Product Overview

The **µFalcon-ST/G** is a highly integrated, extremely compact, high performance, and cost-effective multiservice delivery and Synchronization system.

This product extensively supports both legacy and evolving needs for broadband services delivery, including high throughput, granular SLA enforcement and monitoring, flexible management capabilities and a high degree of scalability and flexibility to cater for future requirements and technology trends.

The **µFalcon-ST/G** primarily addresses applications requiring support for legacy and IP interfaces, as well as complex and challenging scenarios with strict timing and synchronization characteristics.

Such applications include Government oriented applications with mission critical requirements for synchronization of applications, like Command and Control Networks.

The **µFalcon-ST/G** offers a complete toolbox of precision timing support, including an **integrated GNSS receiver**, **BITS** clock inputs/outputs, **Synchronous Ethernet** and **1588-2008** (w/ grandmaster).
The unit provides integrated NTP client and server.

With comprehensive support for circuit emulation services, the **µFalcon-ST/G** provides the ultimate aggregation of T1/E1 services, up through Gigabit Ethernet.

The **µFalcon-ST/G**'s unique Dual Hybrid Core architecture (DHC) supports remote Data Plane Upgrades (DPU). The upgrade allows modifications of the HW core that handles packet processing functions at **full wire speed performance**.

The **µFalcon-ST/G** is equipped with 4x10/100/1000BaseT (RJ45) user ports, 8xT1/E1 CES/Sync ports, and 4xSFP ports acting as UNIs/NNIs. The user ports can be used in a flexible manner and can all operate at full wire speed, leading to a total processing capacity of 20Gbps (non-blocking).

The **µFalcon-ST/G** offers advanced Quality of Service (QoS) features including classification and mapping based on layer 1 through layer 4 attributes, rate limiting and shaping per port, queue and service.

All MEF defined services (EPL, EVPL, ELAN, etc) can be delivered with the **µFalcon-ST/G** series and can further be protected through use of high performance mechanisms, based on G.8031 and G.8032v2, for link, path, and ring protection.

These features, combined with a highly flexible fault propagation mechanism and unique fast failure detection algorithms yield a comprehensive and sophisticated device that can handle virtually any network topology.

The system implements current OAM standards (802.3ah, 802.1ag, Y.1731), HW assisted, as well as proactive measurements and alarming facilities. To complete the OAM toolset, the **µFalcon-ST/G** has a built in packet generator and analyzer to implement RFC2544 and Y.1564 for quick service turn-up and verification.

Comprehensive support for Circuit Emulation Services (SAToP, CESoPSN and MEF8) allows seamless coexistence of legacy and IP networks, or legacy enterprise services.

A **unique Micro-Burst Detection** (MBD, patent pending) technology for microsecond granular SLA monitoring is incorporated in the system, helping to detect, alert, and report nearly invisible traffic anomalies, which is essential in highly QoS-sensitive applications, such as financial, healthcare, etc.

The **µFalcon-S** series is MEF CE2.0 certified.

The **µFalcon-ST/G** is housed in a highly compact, half-19", 1RU chassis (only 150mm/6" deep), and has an integrated internal, dual feed DC power supply (AC optional).

Technical Specifications

Interfaces & Indicators

- 4 x 10/100/1000BaseT (RJ45)
- 4 x 100BaseFX/1000BaseX (SFP)
- 8 x T1/E1 (RJ48)
- Supported SFPs: MM, SM, SFS, CWDM, DWDM
- 1 x RS232 (RJ45) Console
- *LEDs:*
  - Power (per feed), CPU, GPS
  - Link/Activity (per port)
  - Speed (per port)
  - Signal, LOS (per T1/E1 port)

Architecture & Forwarding

- Dual Hybrid Core (DHC) HW architecture
- Data Plane Upgradable (DPU)
- 128MB RAM, 32MB flash memory
- L2 forwarding
- Flow-based forwarding
- Performance: wire-speed, on all ports, all frame sizes
- Total throughput: 20Gbps, non-blocking
- MTU: 9600 bytes
- MAC table: 8K 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

Quality of Service

- Classification based on L1-L4 info
- Ingress policing per flow
- Two rate, 3-color marking
- 8 HW queues/port
- Egress shaping per queue/CoS
- Egress shaping per port
- Scheduling: Strict and DWRR
- P-bit and DSCP remarking
- Storm control: UC, MC, BC

Circuit Emulation Services

- 8 x T1/E1 interfaces
- RJ48, 100ohm
- SAToP, CESoPSN*, MEF8 support
- Multiple and flexible encapsulation over Ethernet & IP/MPLS
- Flexible synchronization schemes (adaptive, line, 1588 and more)

Protection

- *Link*:
  - Link aggregation: static or LACP
  - Instant Link Protection (<100usec)
- Linear: G.8031 (<50msec)
- Ring: G.8032v2 (<50msec)
- *Fault propagation:**
  - Port, service, combinations
  - Inverse, block actions/logic
  - Multiple concurrent rules
- Spanning tree: STP, RSTP, MSTP

OAM & Diagnostics

- IEEE802.3ah link OAM
- IEEE802.1ag CFM, ITU-T Y.1731 PM
- RFC2544 & Y.1564* traffic generator & analyzer (HW based)
- L2/L3 loopbacks with MAC/IP swap
- Micro Burst Detection (MBD) with logging and reporting
- Throughput metering
- Copper TDR, SFP diagnostics (SFF-8472)
- Traffic mirroring

Management

- *Interfaces*:
  - CLI: Console (RS232), Telnet, SSH1/2
  - SNMP: v1/v2c/v3, extensive MIBs
  - Web: HTTP/HTTPS
  - Management VLAN; IPv6 management
- *Authentication:*
  - RADIUS, TACACS+
  - Multiple local users;
  - User access levels (15)
  - Management ACLs
  - 802.1x (port/MAC based)
- DHCP client & relay (incl. option 82)
- Link discovery: LLDP, CDP snooping
- *Operations*
  - Remote System Update (TFTP or Web)
  - Configuration upload/download (TFTP or Web)
  - Auto-configuration
- *Alarms:*
  - SNMP traps
  - Syslog (internal and remote server)
  - CLI events
  - Dying gasp (802.3ah or SNMP trap)
- Remote temperature reading & alarm
- Per port and CoS detailed statistics

Synchronization

- *Synchronous Ethernet:*
  - G.8261, G.8262
  - ESMC (G.8264)
- *GNSS receiver:*
  - Stratum 1 traceable source
  - Operates on GPS, GLONASS, Galileo, BeiDou, and others
  - Automatic tracking of up to 32 satellites
  - 1xSMA connector (antenna input)
  - 3.3VDC active antenna
  - Generates 1PPS and 10MHz (to sync system internally)
- Accuracy to UTC <100nsec
- 8 x BITS inputs/outputs
- *IEEE1588-2008 (PTP):*
  - Ordinary Clock (master, slave)
  - Transparent Clock
  - Boundary Clock
  - Support for 128 messages per second rate
- Built-in Stratum 3 clock
- Optional OCXO, with 1ppb/day holdover (HOC model)
- 1xSMA connector for 1PPS/Clk (in/out)
- *Integrated NTP client and server*

Power & Environmental

- *Power supply*
  - Internal power supply: 20-60VDC, dual feed
  - (AC adapter option)
- Power consumption:
  - Maximum: <27W
  - Typical: <20W
- Passive cooling (no fans)
- *Operating temperature:*
  - Standard: -10°C ÷ +50°C (14°F ÷ 122°F)
  - Extended: -40°C ÷ +65°C (-40°F ÷ 149°F)
- Storage temperature: -40°C ÷ +80°C (-40°F ÷ 176°F)
- Humidity: 10-90%, non-condensing

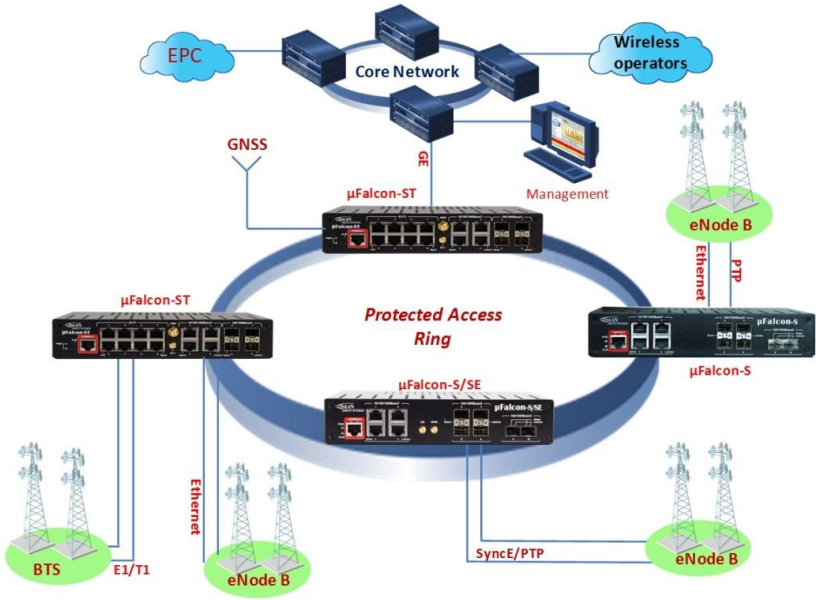
Physical

- *Dimensions* (HxWxD): 44x221x150mm (1.73x8.70x5.90”)
- Weight: ~0.8kg (1.76lb)
- *Mounting:*
  - Desktop/Rack/wall
- *Accessories (more available):*
  - Power cable
  - Console cable
  - Rack mounting kit (optional)

Regulatory & Compliance

- *Safety:*
  - IEC EN60950-1: 2006
- *EMC:* EN 300 386 V1.3.3: Class A
  - FCC CFR 47 part 15, subpart B, Class A
- MEF: **CE2.0**, MEF9, MEF14, MEF20, MEF22
- CE, RoHS

Typical Application: Wireless Synchronization



Ordering Information

Model	Part #	Description
µFalcon-ST8/SE/G/D	7094	Edge Timing Master, 4xUNI, 10/100/1000BaseT ports, 2xUNI SFP ports, 8xE1/T1 ports, 2xNNI SFP ports, SyncE (precision timing) support, integrated GNSS receiver, internal DC (20-60VDC) dual feed power supply
µFalcon-ST8/SE/D/G/ET	7095	Edge Timing Master, 4xUNI, 10/100/1000BaseT ports, 2xUNI SFP ports, 8xE1/T1 ports, 2xNNI SFP ports, SyncE (precision timing) support, integrated GNSS receiver, internal DC (20-60VDC) dual feed power supply, ext. temp. range (-40°C ÷ +65°C)
µFalcon-ST8/SE/G/HOC/D	7088	Edge Timing Master, 4xUNI, 10/100/1000BaseT ports, 2xUNI SFP ports, 8xE1/T1 ports, 2xNNI SFP ports, SyncE (precision timing) support, integrated GNSS receiver, high stability OCXO, internal DC (20-60VDC) dual feed power supply
FPA40	7108	AC (100-240V) to DC (48V) power adapter, 40W

Specifications are subject to change w/o prior notice

GNSS accessories (antenna, cable, etc.) are available – contact for details

Note: for a complete list of available Falcon models please contact Fibrolan

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