FX Series 6.2.8

WAN Optimization

FX-4010c

FX-1010c

FX-1005e

WAN Optimization: Delivering Fast Broadband QoE, Not Just High-Speed Connectivity

When it comes to Internet access over satellite, high-speed connectivity does not necessarily equate to a fast broadband user experience (as what end-users expect when connected onto 4G, wireless or wireline terrestrial networks). To users, a crisp web browsing experience, responsive user interaction together with rapid content display speeds are paramount for delivering a good QoE (Quality of Experience).

Due to the nature of the protocol used for delivering Internet content (i.e. TCP), the satellite latency and the inherent satellite link (in Ka band) or Internet impairments (packet drops), can negatively impact a user experience regardless of bandwidth capacity. Furthermore, the problem is worsened today through feature rich browsers / mobile apps and inflated web pages media content: a typical web page nowadays routinely consists of 250+ objects of variable sizes, from a few KByte to over 10MByte, – and therefore HTTP/TCP connections, collected through more than 50 to 100 different servers. Without optimization, this content presents a slow and non-responsive user experience over satellite.

Typical Users

- Internet Service Providers (ISPs)
- Telecommunications Operators (CSPs)
- Satellite Service Providers
- Managed Services Providers Use

Common Applications

- Satellite Broadband Internet Backhaul (Maritime, Rural, Mobility)
- Corporate Networks Internet Access over Satellite (Oil & Gas, Mining, etc.)

The Solution: Comtech's WANOp

To mitigate the adverse effect of satellite latency on web browsing, a Protocol Enhancement Proxy server (PEP) needs to be put in line at both ends of the satellite link to process the user traffic. That is the role of Comtech WAN Optimization (WANOp) solution.

Unique to Comtech's WANOp solution is the focus on the end-user experience – in particular the Web browsing experience. Acceleration technology used to mitigate satellite delay has been around for a while, solutions which have been standardized as the SCPS-TP protocol, used by most vendors today. While SCPS-TP does a good job of maximizing the available link bandwidth and increasing file transfer speed (FTP applications), its efficiency is rather limited when it comes to the application that matters the most to end-users: web browsing.

This is where Comtech's WANOp solution comes to play: Comtech's WANOp uses a combination of techniques to deliver both lightning fast file transfer AND a true broadband web browsing / Internet access user experience.

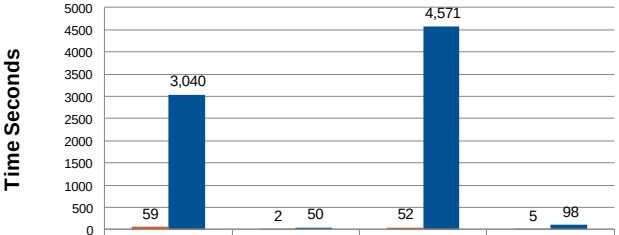
Key Features

- Turbostreaming© dramatically improves file downloads and web browsing QoE across satellite links, enabling a terrestrial-like fast broadband user experience (> 100 Mbps)
- Optional QoS and traffic optimization features
- Real-time dynamic traffic shaping with ACM enabled Comtech EF DATA modems (for Ka band satellite links)
- High Availability platform (power supply redundancy, 1+1 system redundancy, line bypass)

Turbostreaming©

- Comtech's patented Turbostreaming technology is built around 3 concepts, ensuring faster content delivery for both small and large objects download over TCP connections, which is quite common on today's typical web pages **TCP Connections Local Acknowledgment**: End user (Host) and Server TCP connections are terminated respectively at the remote and hub PEP servers. This enables fast local acknowledgment of the information received and faster connection setup. It also limits re-transmission in case of data loss at either end of the connection. Meanwhile, a proprietary protocol suited for satellite transmissions is used on the WAN segment, which mitigates the effect of satellite delay.

Transfer Times Per Non-Compressible File (Seconds)

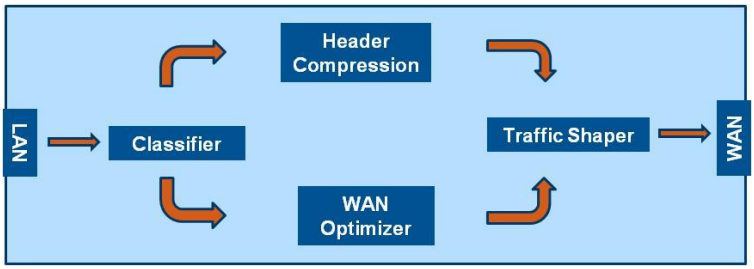


	GET Large Non-Compressible	GET Small Non-Compressible	PUT Large Non-Compressible	PUT Small Non-Compressible
Comtech FX	59	2	52	5
Direct	3,040	50	4,571	98

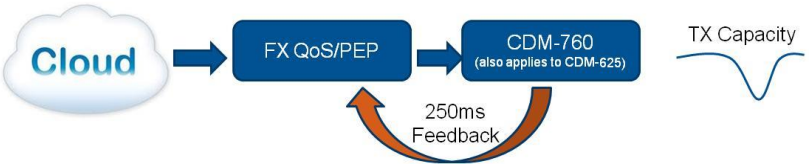
- **Persistent WAN Connections**: Local ACK of TCP connections combined with persistent TCP WAN connections reduce the delivery time of content by up to 50% when applied to short TCP connections / small objects, which make up to 80% of all the TCP connections on web page downloads.
- **WAN TCP Connections Multiplexing**: Turbostreaming enables the multiplexing of large object downloads (or uploads) such as HD images/pictures and videos onto parallel WAN connections, effectively multiplying the speed of these objects downloads / uploads across the WAN (available satellite link bandwidth permitting). Combined with expanded TCP window buffer size, Turbostreaming is able to reduce download/upload time by a factor of up to 65%.

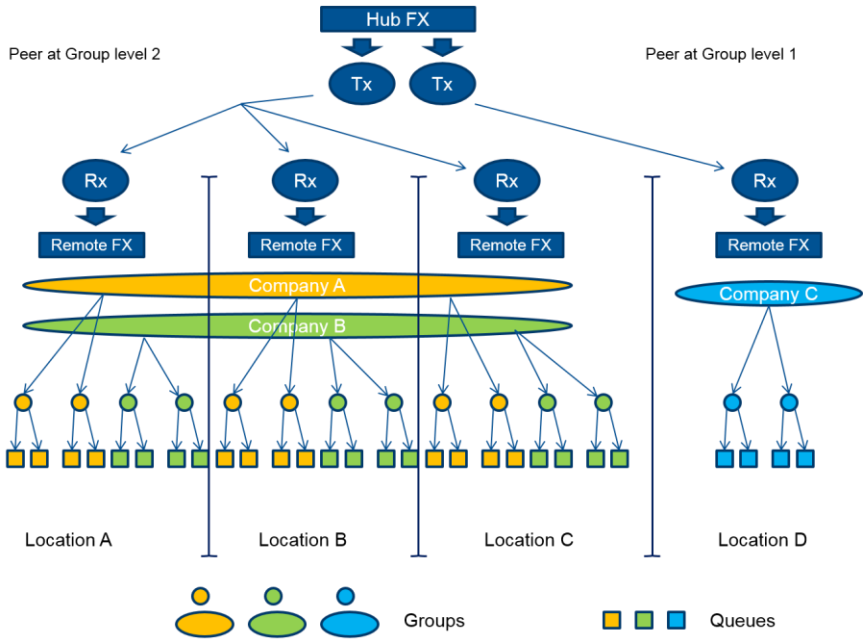
QoS and Dynamic Shaping

The FX Series provides traffic shaping on the WAN interface, with a flexible, three level shaper that supports point-to-point and point-to-multipoint links. Traffic shaping consists of two-step processing, classification and drain. The FX supports many types of classification to allow working with multiple links, multiple users and multiple types of traffic. Classifying can be done with source/destination IP address, subnets, protocol type, Layer 4 ports, DSCP, VLAN p/q and MPLS label/EXP. CIRs and MIRs can be established at each of the levels of classification.



Draining of the WAN link output queues (or shaping) can be static according to the preset WAN TX link bandwidth value at configuration, or it can be dynamic, with the FX having the ability to regularly poll the associated modem to know the real-time data rate, using a configurable standard SNMP protocol OID. This is quite useful when working with ACM enabled satellite links where the WAN capacity changes rapidly and on a regular basis. Dynamic shaping oh the traffic, therefore, avoids random packet discards, which are detrimental to applications.





Bandwidth Optimization

The WANOp bandwidth optimization features are available within the QoS function and the PEP function:

QoS function: traffic optimization functions are activated on a per queue basis. The features available are:
(i) packet Header Compression & Packet Aggregation (HC/PA), and,
(ii) packet Payload Compression (PC).

Those features typically apply to voice, 2G Abis, or 3G Iub R99 traffic, which can be identified by their ToS or Diffserv values (small packets traffic). Optimization ratio ranges from above 50% for voice traffic to 25-30% for 2G/3G traffic, depending on the vendor and voice/data traffic mix.

PEP function: Traffic optimization can also be turned on for specific applications (Layer 7 protocols): HTTP and FTP (only apply on non-encrypted traffic). Available options are:

- HTTP traffic: Object Caching, Image smoothing/resizing, GZIP compression
- FTP traffic: GZIP compression, DEDUP Block Caching

Note: Wide spread usage HTTPS (encrypted HTTP) is rapidly making Layer 7 Web traffic optimization features obsolete or of limited value.

Network Operation and Scalability

The FX Series appliance can be deployed "in-line" (in-path) with the satellite modem to take advantage of the FX fail-safe line bypass feature, or, out of path. In the latter case, a router is required to connect the appliance, using PBR (Policy Based Routing) or the WCCP protocol. When WCCP is used, the FX must be configured in Layer 3 Routed mode of operation, and can be connected to the network (router) through one single LAN interface. WCCP and PBR also allows scaling to Comtech's WANOP solution through stacking multiple appliance, while providing N+1 system redundancy.

"In-line" Operation

"Off-line" Operation

VLAN trunking and VRF support

The FX Series appliance supports VLANs in trunk mode. However, only the traffic belonging to the VLANs explicitly declared, and associated each with a virtual in-path interface, will be processed and accelerated. The traffic belonging to VLANs not declared is passed through transparently. In addition:

- Virtual Routing and Forwarding (VRF) and duplicated IP address space within VLANs are supported.
- Caches –when applicable- are maintained by appliance and by VLAN
- QoS rules can be set per VLAN

Note: QinQ (Stacked VLANs) are not supported.

Detailed WANOp Software Feature List

- TCP PEP [Performance Enhancement Proxy]
  - ADC/REM Operation (Remote initiated TCP connection – download or upload)
  - Optional two-ways operation (meshed network, server initiated connections) – require two appliances combined
  - Local TCP sessions acknowledgement
  - TCP/FTP Turbostreaming proprietary satellite link enhancement protocols and WAN acceleration (Download / Upload)
  - Persistent TCP WAN connections (Local TCP ACK / setup of TCP cnx)
  - Variable WAN TCP buffer window size per connection – automatically adjusted to fit link bandwidth
  - Support HTTP, HTTPS, HTTP/2, SSL, FTP and Generic TCP traffic acceleration
- In-Path and Out-of-Path WCCP or PBR routed mode operation
- Layer-2 Bridge mode and Layer 3 IP static routing operation
- VLAN support - trunking mode only (VLAN access control and QinQ not supported)
- 3 Tier Layer 2- Layer 4 QoS
  - Per destination (VLAN, IP Subnet)
  - Per Traffic Type (VLAN p bits, MPLS EXP bits, IP TOS and Diffserv)
  - Per Protocol (UDP/TCP ports)
- Dynamic shaping
  - Based on modem real-time available TX throughput
- Optional* Layer-2-Layer4 Header Compression[1]
  - Ethernet-MPLS (one or two labels)
  - IP-TCP-UDP
  - Packet Aggregation

- Optional* Generic Packet Payload Compression (GZIP)
- Optional* HTTP Traffic optimization
  - Image Re-sizing
  - Object Caching
  - Payload compression (GZIP)
- Optional* FTP Traffic Optimization
  - Payload Compression (GZIP)
  - DEDUP Block Caching
- HA (High Availability)
  - Automatic hardware fail to wire (line-bypass)
  - Optional 1+1 system redundancy (in-line)
- Passive Traffic Monitoring
- Management and Operation
  - Web GUI, CLI
  - Out-of-band management interface
  - Comtech NetVue Operation (configuration, supervision)
- Real-time traffic LAN/WAN captures (using standard PCAP format, readable by Wireshark software tool)

Specifications

Model	FX-1005e	FX-1010c	FX-4010c
Form Factor	1RU	1RU	1RU
Weight	2.0 lbs. (1.2kg)	12 lbs (5.6 kg)	20.7 lbs. (9.4 kg)
Dimensions (h x w x d)	1.7" x 6.97" x 5.73" (43 x 177 x 145.5 mm)	1.7" x 17.0" x 12.0" (43 x 432 x 305 mm)	1.7" x 17.2" x 20.1" (43 x 438 x 510 mm)
Nb Ethernet ports	4 x GE RJ45 (LAN, WAN, MGT, AUX)	6 x GE RJ45 (2xLAN, 2xWAN, MGT, AUX)	4 x GE RJ45 (LAN, WAN, MGT, AUX)
Nb Line bypass (fail to wire) ports	1	2	1
Path Redundancy (LAN, WAN)	NO	YES	NO
Rack Mount Kits	Optional	Built-in	Built-in
Traffic processing capacity in Mbps (aggregated throughput TX+RX)	100	200	400
Maximum user client TCP sessions accelerated	20k	20k	30k
Licensing Tier * (WAN TX Mbps)	5, 10, 25, 50	5, 10, 25, 50, 150	150, 300
Power Supply - UL Approved, FCC Compliant	Auto (100V-240V) AC Power with 60W external power supply adapter	Single or Redundant Hot Swap DC or AC Power Power consumption: 70W	Hot Swap 1+1 AC Power Supplies Auto (100V-240V) Power consumption: 150W
Power Supply Safety/EMC Certifications	FCC Part 15 Subpart B Europe/CE Mark ROHS, UL (CA, US)	FCC Part 15 Subpart B Europe/CE Mark ROHS, UL (CA, US)	FCC Part 15 Subpart B Europe/CE Mark ROHS, UL (CA, US)
Environmental	Operating temp 0 - 40°C Storage temp -20 to 70°C Operating relative humidity 8 - 90% (non-condensing)	Operating temp 0 - 60°C Storage temp -20 to 70°C Operating relative humidity 8 - 90% (non-condensing)	Operating temp 5 - 35°C Storage temp -40 to 70°C Operating relative humidity 8 - 90% (non-condensing)

Note (*): The license limits the maximum throughput of the traffic sent to the WAN (TX) – after optimization / compression- to the specified license value. Traffic in excess will be queued and eventually discarded.

2114 West 7th Street, Tempe, Arizona 85281 USA
Voice: +1.480.333.2200 ● Fax: +1.480.333.2540 ● Email: sales@comtechefdata.com
See all of Comtech EF Data's Patents and Patents Pending at http://patents.comtechefdata.com
Comtech EF Data reserves the right to change specifications of products described in this document at any time without notice and without obligation to notify any person of such changes. Information in this document may differ from that published in other Comtech EF Data documents. Refer to the website or contact Customer Service for the latest released product information
© 2018 Comtech EF Data