

Multi-Gbps payload links utilize WAN-Express Applications to transport real time data from antenna sites to data processing nodes.

Our WAN-EX Applications encode network packets to transport high rate data streams while improving the underlying WAN's Quality of Service.

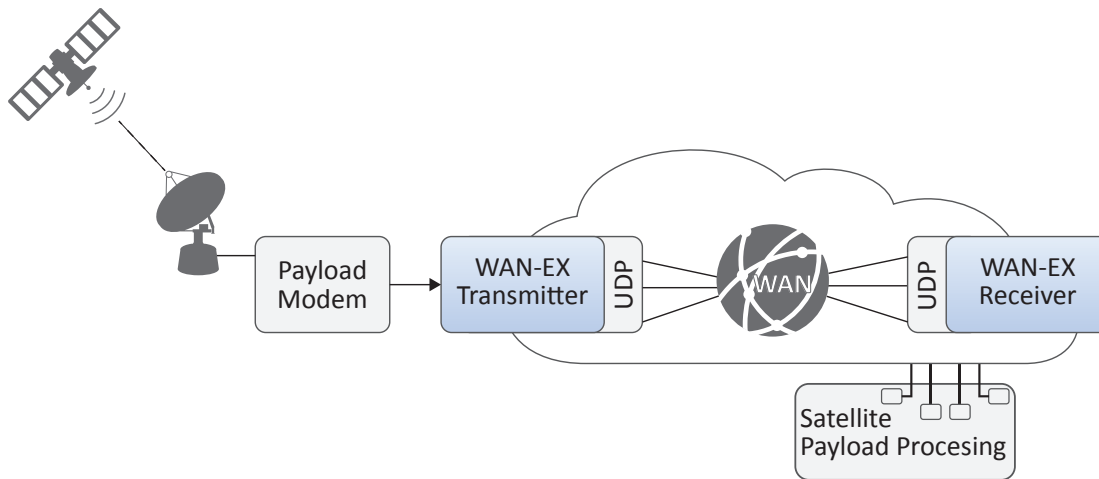
**SOFTFEP**<sup>®</sup>  
**WAN-Express (WAN-EX)**  
formerly WAN FEC

- **Data Delivery to Cloud Processing.** The WAN Express Applications enable high data rate pipes in and out of cloud processing architectures, allowing large volumes of time-sensitive data to be transported and processed in near real time.
- **Reliable Data Transport.** The data streams flowing through WAN Express are encoded, along with sequence counters and other flags that are added to each network packet to detect and recover missing or out of order network packets.
- **Improved Quality of Service.** Wide area networks with the capacity to transport multi-Gbps of continuous data are costly, particularly if one or more of the end points are geographically remote from major urban areas. Purchasing this capacity with a high QoS (low packet loss) only adds to the price. AMERGINT's WAN-EX Apps improve on the inherent WAN QoS without the need for network retransmission. They may enable customers to purchase their WAN with a less-expensive QoS.
- **Packet Loss:** Even with a WAN Quality of Service (QoS) at 99.95%, transport of a 10 Gbps data stream results in tens of thousands of packets being lost over a ten minute contact.
- **WAN Forward Error Correction.** WAN-EX Applications overcome packet loss without costly retransmits to improve data delivery for multi-Gbps data streams that must be moved across a wide area network in real time where there are no "gaps" in the data streams and therefore no window to catch up after network errors.
- **Point-to-Point and Multicast.** Data packets from a transmit location can be sent to one receiver or the data fanned-out to multiple destinations, using point-to-point connections for each source-destination pair. The underlying WAN Express Algorithms work in tandem on both the sender and receiver end points.
- **WAN Bandwidth Aggregation.** WAN Express supports splitting a high rate data stream across multiple lower bandwidth WANs. Each link is individually encoded at the sender and decoded at the receiver, where the composite data stream is reaggregated. This capability is particularly useful in locations that may be only served by lower rate IP networks.
- **Deterministic Latency.** The WAN-EX Apps allow the user to define a desired edge-to-edge network delay across the WAN so that data is continuously delivered with a fixed latency.

# WAN-Express (WAN-EX)

formerly WAN FEC

AMERGINT's WAN-Express Software manages and improves data transport of continuous data streams across wide area networks, moving high rate payload data from earth receipt to cloud processing.



Despite high network reliability, thousands of packets can be lost every minute in the network transport of multi-Gbps data streams, forcing either data gaps or costly retransmission.

High rate, continuous data streams have no “gaps” in the data, meaning there’s no window to catch up after network errors. In addition, there may not be any means to retransmit data packets in the event of network outage—the data is simply lost. These data stream present a challenge for traditional network protocols such as TCP and UDP. With TCP, losses on the network can result in large variations in WAN latency as TCP implements its sliding windows to control network congestion, and with UDP, network errors result in permanent loss of network packets. WAN-Ex provides the guaranteed delivery of TCP with fixed latencies.

## Comparison of Network Protocols for High Rate Data Streams

WAN Performance Parameter	TCP	UDP	UDP with WAN-Ex
Guaranteed Delivery	Yes	No	Yes (Other Than Outages)
Packet Ordering	Yes	No	Yes
Random Packet Loss Recovery	Yes (Via Re-transmit)	No	Yes
Outage Recovery	Variable (Can Be Lengthy)	No	Yes
Latency	Highly Variable	Relatively Fixed	Fixed
Tuning Required	Yes	No	Yes
Network Protocol Loading	~110% of Data Rate	~105% Data Rate	<115% of Data Rates > 5 Gbps <120% for Data Rates > 1 Gbps

- **Detailed Information.** A technical paper on AMERGINT's WAN-Express implementation is available upon request.