OpenSpace®

WAN Transport Protector (OWTP)
Reliable and Assured Transport of Critical Data over Impaired Networks

WTP optimizes data transfer rates, controls latency, insures data delivery and provides network situational awareness.

Challenge – Assuring Reliable Transport of Data for Earth Observation and Remote Sensing Missions

As more and more Earth Observation (EO) and Remote Sensing (RS) data is being beamed from satellites, it is critical to ensure the delivery of mission critical data to its destination reliably and with complete integrity.

Enabling a More Reliable and Dynamic Ground - OpenSpace Platform

Kratos' OpenSpace platform is the industry's only fully virtualized, software-defined and orchestrated satellite ground system platform that overcomes these transport challenges by enabling the delivery of critical IP streams over impaired WAN links to assure the reliable delivery of data.
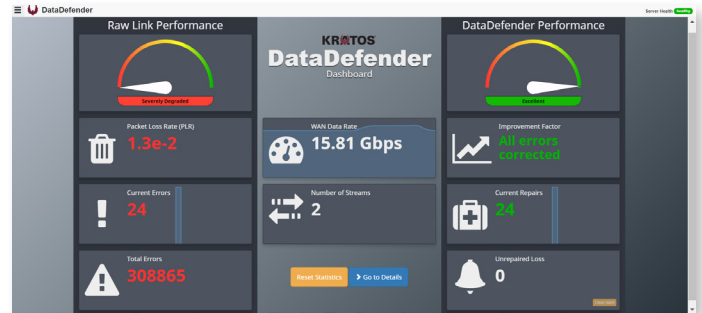
Fully Virtualized EO and Remote Sensing Service Chain

As part of the OpenSpace Platform, Kratos offers a completely virtualized and software controlled service chain that enables a fully automated EO sensing mission downlink from the digitizer all the way to post satellite pass processing.

In the platform, dedicated analog RF hardware devices are turned into software in the form of Virtual Network Functions (VNFs) that run on commodity servers on premise or in the cloud.

These OpenSpace VNFs are service chained together to deliver an EO and RS downlink without having to make changes in hardware.

The process starts by digitizing the RF at the antenna using Kratos' SpectralNet Wideband digitizer, the OpenSpace

WAN Transport Protector (OWTP) VNF can then assure the transport of digitized IP packets across any potential impaired WAN links.

The VITA 49 digital stream is then processed by the wideband OpenSpace Receiver (ORX) VNF and the OpenSpace Stream Processor/Recorder (OSPR) VNF records satellite-based sensor telemetry data during a spacecraft pass and supports real-time streaming of downlink data and routing to other processing chains in real-time.

Assuring Reliable Transport with WAN Transport Protector (OWTP)

As part of the EO/RS service chain, OWTP transports critical IP streams over impaired WAN links to assure the reliable delivery of critical data. The VNF protects application-specific data transfers against loss with no special router or network configuration.

Key Benefits of OWTP
- *Assures reliable traffic delivery*
- *Protects data while transporting time critical data sets*
- *Moves data at high speed over global IP networks*
- *Overcomes packet loss, out of order packets, duplication, and jitter*
- *Boosts network visibility and Quality of Service (QoS)*
- *Maximizes bandwidth while controlling latency for mission critical needs*

Flexibly Configure Network For Assured Transport

Systems that rely only on traditional network protocols like UDP or TCP have historically struggled to sustain the throughput and quality necessary for transporting digital IF across a WAN. Neither protocol is optimal for WAN distribution of real-time high throughput data.

OWTP enables the network operator to select the transport protocol protection that best fits the traffic delivery requirement. This includes Packet Forward Error Correction (PFEC) which eliminates packet loss and controls end-to-end latency for one way transmissions. Another option is Intelligent Retransmission Protocol (IRP) for bidirectional data transfers. It prevents loss of data while reducing overhead
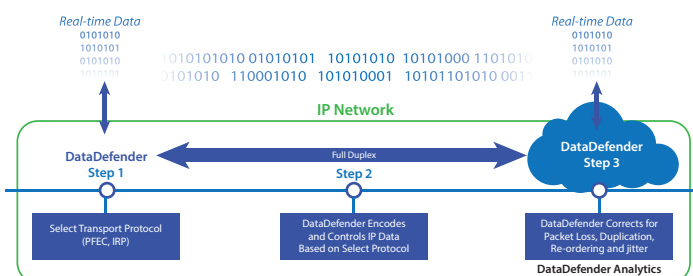
OWTP enables a network operator to assure traffic delivery in three easy steps.

caused by retransmissions. Based on the chosen protection protocol, OWTP encodes and controls the IP data latency, then corrects for packet loss, duplication, packets out of order and jitter to deliver the critical data.

## Increased Network Visibility and QoS
In addition to correcting WAN impairments, WTP provides network situational awareness by reporting detailed metrics about each flow.

WTP delivers visibility into data transport and performance by displaying errors and corrections at a sub-second measurement. This enables network operators to quickly

identify and isolate network problems to overcome them and boost network quality of service.

Network Insights and Analytics
Measurements are recorded for each stream, and include packets lost, distance in between loss events, burst loss length, number of packets re-ordered, and latency distributions, among others. In addition, a complete history of WAN link events is maintained and is viewable down to a resolution of 100ms. This data can be fed into OpenSpace's management capability OpsCenter Platform which allows the entire system to detect and respond to faults and threats.
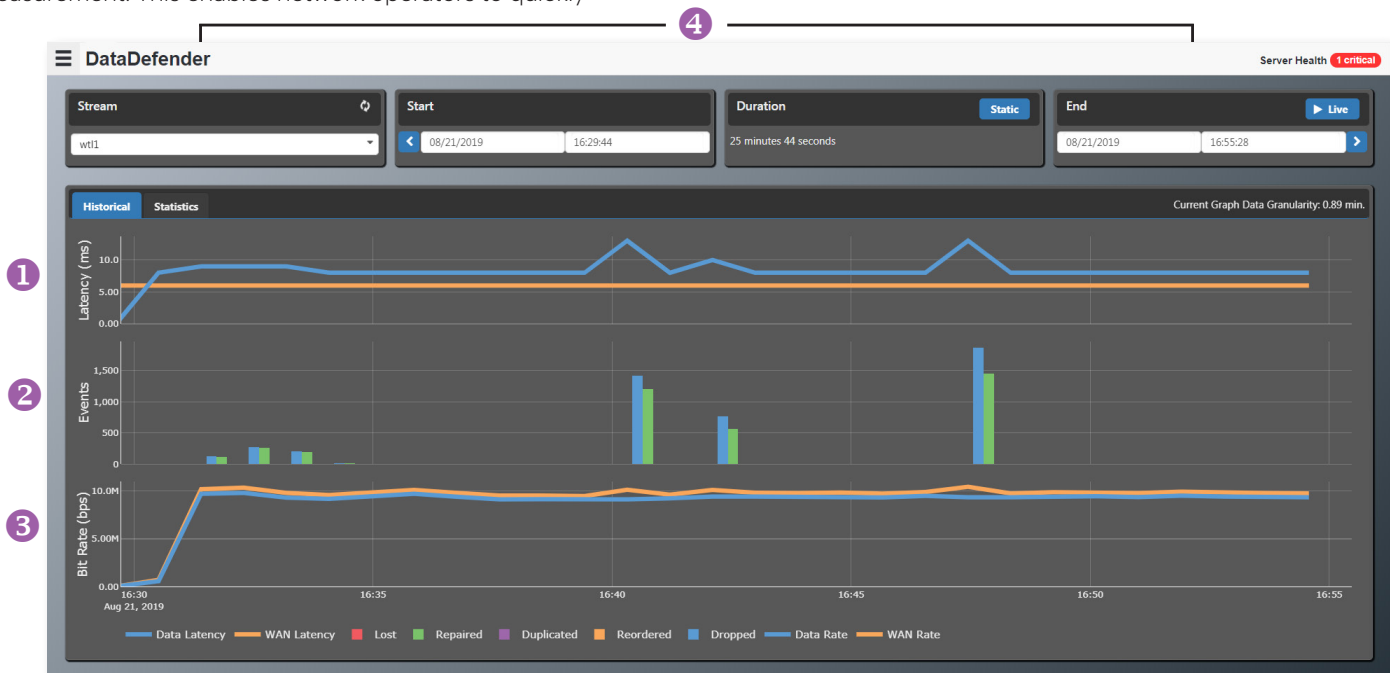
Sub-second display of packets dropped/repaired and WAN thrtoughput.

❶ *Latency: shows input data rate latency and how it is controlled on the WAN side*

❷ *Events: displays dropped and repaired packets*

❸ *Bit Rate: indicates that WAN rate with protection is slightly higher than data date*

❹ *Streams: control and view details of stream*

Technical Specifications
When hosting WTP on premise or in the cloud, these are the recommended server requirements that will support the number of protected streams as identified in the stream count.

Minimum Suggested System Requirements

VNF	Stream Count	LAN Interface	WAN Interface	CPU	vCPUs*	RAM	Storage
100 Mbps	10	1 Gbps	1 Gbps	1x2 GHz	12	8 GB	1 TB
1 Gbps	50	1 Gbps	1 Gbps	1x3.6 GHz	24	24 GB	1 TB
10 Gbps	100	10 Gbps	10 Gbps	4x3.1 GHz	48	192 GB**	1 TB

* The vCPU number represents the HyperThreaded CPU count. For example for the Intel Xeon Gold 6242R processor (24C/48T) the vCPU count is 48.
** Imperative to maximize CPU-2-memory throughput by implementing a balanced 6-lane configuration by deploying six RAM modules per CPU socket. For example 6x16GB RAM modules to achieve 192GB of RAM
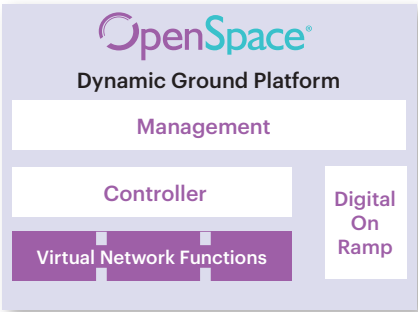
OpenSpace is the industry's first and only fully virtualized, software-defined and orchestrated satellite ground system platform. The OpenSpace platform includes Virtual Network Functions, such as OWTP for the reliable transport of data that form a virtual service chain. The OpenSpace Controller to administer how service chains are deployed and OpenSpace OpsCenter to provide unified management across the entire satellite ground system.

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