

OpenSpace™ Wideband Software Receiver

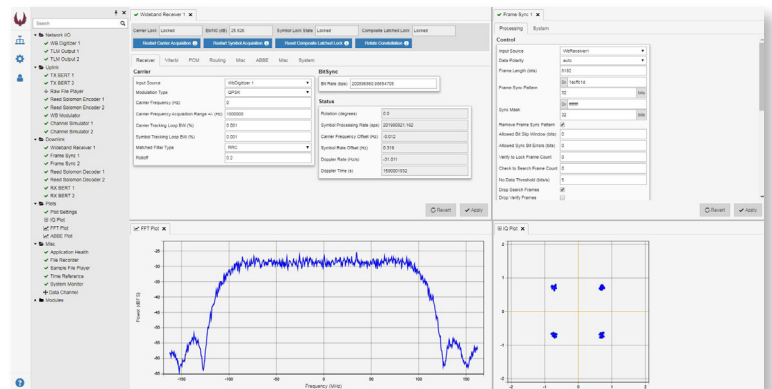
Scalable & Cost-Effective Signal Processing for Earth Observation & Remote Sensing



As more and more earth observation data is being beamed from satellites, the infrastructure on the ground has to be more flexible, cost-effective and scalable to meet the demand. The infrastructure needs to be agile enough to process the signals and download the data based on changing and on-the-fly demand.

Kratos is at the forefront of virtualizing the ground system to deliver increased flexibility, resiliency, scalability, and security, all at lower costs. The OpenSpace™ Wideband Software Receiver from Kratos dynamically adapts to meet the needs of earth observation data processing ground stations.

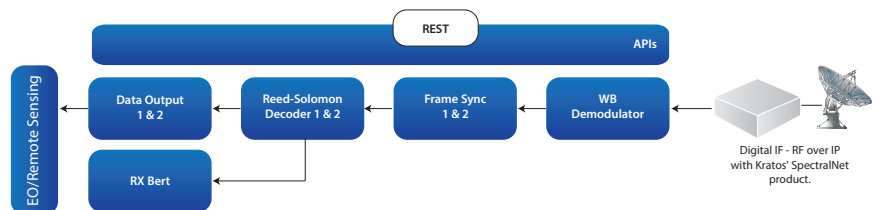
The OpenSpace Wideband Receiver is a complete software implementation, with no FPGAs or GPUs, and takes advantage of standard x86 server architectures. The wideband software receiver capitalizes on the advantages of virtual and cloud-based architectures and offers unmatched performance with 440 MHz of Instantaneous Bandwidth to support downlinks. The OpenSpace Wideband Software Receiver can be implemented on generic compute hardware, or as virtual instance(s) in private or public cloud platforms.



OpenSpace Wideband Software Receiver screenshot showing signal performance and displaying the spectrum and IQ plot.

The OpenSpace Wideband Software Receiver easily fits into existing ground architectures and provides great scalability, resilience and security, while remaining cost-effective. As customer demands increase, additional virtual instances can be instantiated to meet these dynamic missions, while also adapting to changing requirements to ensure delivery on Service Level Agreements (SLAs). The OpenSpace Wideband Software Receiver also lowers costs by minimizing the use of proprietary and purpose built hardware.

The solution utilizes a powerful Software Defined Radio (SDR) developed from more than 30 years of experience designing and implementing ground system products for some of the most critical commercial and government missions. The software receiver includes the capability to demodulate, error correct and bit-sync payload data at rates up to 600 Mbps. The OpenSpace Wideband Software Receiver



OpenSpace Wideband Software Receiver system architecture

embraces open, industry-standards and provides demodulation of several common waveforms, decoding, and forward error correction methods. Monitoring and control is performed using the HTML5 user interface or using one of the following APIs: REST or GEMs.

Benefits of a Software Based Receiver

The OpenSpace Wideband Software Receiver offers a powerful, agile and scalable approach to ground system infrastructure.

Features	Benefits
100s of missions, 1000s of passes per month	Field proven performance
Industry standard interfaces	Management ease
Eliminates dependency on dedicated hardware	Reduces cost, risk and maintenance
Decouples the processing from the hardware	Improves scalability
Common cloud compatible infrastructure	Increases flexibility
Dynamic installation and teardown	Increases automation

Key Capabilities

- Carrier tracking, demodulation, bit-synchronization and digital processing of Digital IF signals at transmission rates adjustable up to 600 Mbps
- Digital signal processing implementation for flexibility to support different demodulation and processing schemes, and unlike legacy analog implementations, requires no calibration
- Supports downlink processing of BPSK, QPSK, OQPSK, and 8SPK signals
- The demodulation processing is supplemented by bit synchronization, Pulse Code Modulation (PCM) code conversion, digital filtering, and adaptive signal equalization for transmission optimization
- Multiple Forward Error Correction (FEC) options are currently supported including Viterbi and Reed-Solomon (RS)
- Output from the application is 1 GbE and 10GbE IP packets over Ethernet

Technical Specifications

Demodulation	
Description	Capability
Number of Receive Channels:	1
Direct Demodulation Types:	BPSK, QPSK, OQPSK, 8PSK
Direct Symbol Rate:	20 Msps to 200 Msps
Forward Error Correction (FECs):	Single Viterbi Decoder per Channel Rate = $\frac{1}{2}$ (K=7) CCSDS Polynomial Reed Solomon Decoding (223,255), (239,255)

Fully Virtualized Earth Observation Signal Processing Solution

Kratos offers a completely virtualized infrastructure for Earth observation and remote sensing applications. After digitizing the RF at the antenna using Kratos' SpectralNet Wideband product, the VITA 49 digital stream is processed by the OpenSpace Wideband Software Receiver and the quantumDRA, Kratos' digital recording application, which stores the data for playback or streaming in real-time.