OpenSpace™

Enabling Dynamic Earth Observation and Remote Sensing Services Chains

The EO & Remote sensing service chain is designed, tested, activated, monitored and reported on using the OpsCenter dashboard.

Challenge – Manual and Static Services

As more and more data is being beamed from Earth Observation (EO) and Remote Sensing (RS) satellites, the infrastructure on the ground must become more flexible and cost-effective.

The traditional approach of manually cabling hardware back-to-back to deliver a service is time-consuming, hard to deploy and is challenged to keep pace with demands of the EO and RS world. There is also a growing demand to drive downlink data to the cloud for the enhanced processing capability.
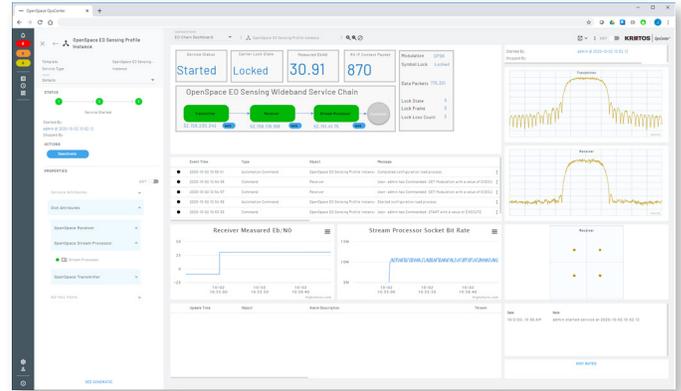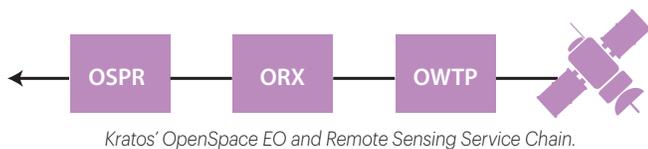
Solution –OpenSpace Platform and Dynamic Service Chains

The OpenSpace™ platform is the industry's only fully virtualized, software-defined and orchestrated satellite ground system platform that addresses this need for highly EO/RS dynamic services.

With OpenSpace, organizations can move from a standalone physical or virtualized capability to fully cloud-centric EO and RS service chains with a controller and management layer to enhance automations and drive scalable operations.

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.

Kratos' OpenSpace EO and Remote Sensing Service Chain.

- OpenSpace WAN Transport Protector (OWTP) - assures the transport of digitized IP packets across any potential impaired WAN links.
- OpenSpace Wideband Receiver (ORX) – offers an unmatched level of digital signal processing in software with 600 Mbps of throughput to support downlinks across several hundred MHz of instantaneous bandwidth.
- OpenSpace Stream Processor/Recorder (OSPR) - supports recording of EO & RS satellite sensor telemetry, allowing for highly-configurable options for recording of data during a spacecraft pass for playback or streaming in real-time.

Intelligent and Automated Service Chains - OpenSpace Controller

The OpenSpace platform centers around the OpenSpace Controller, the brain center that controls how VNFs are service-chained to deliver the right options for the EO mission. The OpenSpace controller also brings industry-standard and open interfaces to facilitate deeper integration with mission planning workflows and service orchestration systems.

The OpenSpace controller intelligently and automatically sequences the OWTP, ORX, OSPR and VNF's to form the

Key Benefits of EO and Remote Sensing Service Chain
- *Save time - accelerate service delivery process – from weeks to hours*
- *Increase revenue and customer satisfaction - launch more services and get them to market faster*
- *Optimize efficiency - maximize the usage of network resources to almost 100%*
- *Reduce costs - automate manual tasks, decrease hard ware usage and optimize staff productivity*
- *Leverage emerging cloud-based processioning and GSaaS platforms to smartly drive CAPEX decisions*

virtual EO/RS service chains. The service chain can then be activated and de-activated dynamically to react to changes in supply, demand, and threat.

Automate End-to-End Service Flows
Using third party orchestration frameworks, service providers can use automated workflows to deliver a service end-to-end. The workflow starts with the customer request, then communicating the resources and schedule to the OpenSpace platform which then automatically spins EO service chains up and down hundreds of times a day to support different payloads, satellites and for different configurations.
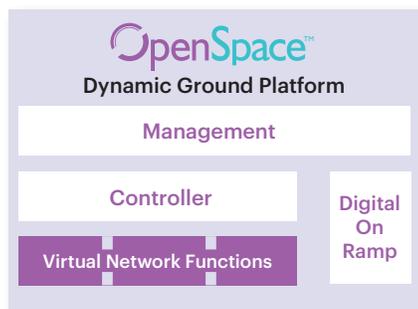
Management, Administration and Configuration of Service Chains
OpsCenter is OpenSpace's unified manager which administers the service chain lifecycle and bridges virtual network function management functions together with physical network devices and RF gateway components. Together, the integrated capabilities in the platform enable far greater scale, automation and resilience than can be achieved in closed, hardware centric solutions.

OpsCenter enables network engineers to design templates for EO/RS service chains.

- Saves time by moving away from manually configuring individual hardware or virtual devices in separate element management systems
- Simplifies provisioning of services with just tens of service-centric settings instead of hundreds of device specific configurations
- Provides a unified view of EO/RS missions with configuration and monitoring details in a centralized dashboard
- Enables the ground system to instantly respond to changes in supply, demand and threat with dynamic service chains

OpsCenter enables the development of service chains through a lifecycle process from design, testing, spinning up and down, monitoring and reporting.
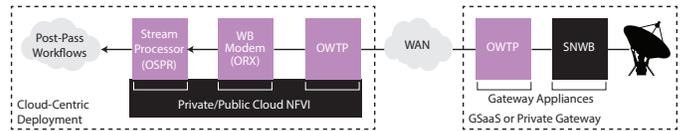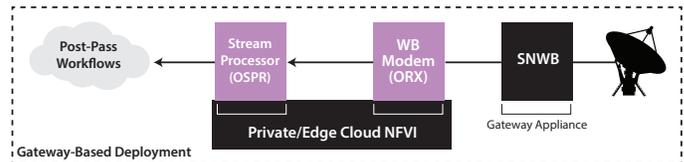
Deployment of Service Chains
The EO/RS service chain can be deployed in either cloud-centric or gateway-based environments to allow flexibility. In the cloud-centric deployment the WAN Transport Protector (OWTP) is installed at each end of the terrestrial WAN link, to assure the traffic is delivered from the gateway site in an assured and reliable manner. The VNFs used for signal processing are automatically provisioned and deployed in the private- or public-cloud processing center.

Cloud-centric service chain deployment.

The gateway-based deployment is intended for organizations needing flexibility for local processing, or sensitive missions that may not be appropriate for centralized or public-cloud processing environments. The digitized signal is transported directly to the on-premise data processing or edge-cloud environment and pipelined into the EO/RS service chain for further downlink and post-pass processing.

Gateway based service chain deployment.

Adopting the OpenSpace Platform
The OpenSpace Platform can be purchased as a complete platform or in modular building blocks including RF digitizers, the OpenSpace Controller and OpsCenter management functions along with the VNF Service-Chains to meet EO and remote sensing mission needs.

OpenSpace is the industry's first and only fully virtualized, software-defined and orchestrated satellite ground system platform. The OpenSpace platform includes an EO/RS service chain. The OpenSpace Controller administers how service chains are deployed and OpenSpace OpsCenter provides unified management across the entire satellite ground system.