

# INTUITION

## DYNAMIC RESOURCE ORCHESTRATION OF SPACE AND GROUND SEGMENTS

Resource orchestration is the foundation of modern network operations, enabling the efficient management, optimization, and integration of resources across all levels of the network.

For satellite networks, where complexity spans space and ground segments, orchestration is essential to create dynamic, automated systems that deliver simple, reliable outputs to end users. By coordinating diverse assets, resource orchestration empowers satellite operators to adapt to evolving demands and streamline operations in a rapidly advancing industry. From dynamic payload management and real-time network monitoring to scalable cloud operations and API-driven automation, these systems ensure seamless interoperability and optimal performance.

## SATELLITE DOMAIN NETWORK RESOURCE PLANNING

Efficient resource planning in the satellite domain is critical for optimizing assets both in orbit and on the ground. Orchestration enables real-time adaptability, allowing operators to adjust configurations, routing, bandwidth, frequency, and beam settings as conditions change. By aligning these elements, operators enhance the efficiency and reliability of satellite communication services, ensuring seamless connectivity and superior service delivery.

### Dynamic Configuration

adjusts ground resources and payload settings in real time to respond to changing conditions.

### Resource Allocation

efficiently distributes available resources to maximize performance and service quality, including bandwidth, power, time, and link resources.

### Real-time Management

applies these changes with minimal disruption and optimal operation.

## SATELLITE PAYLOAD MANAGEMENT

Satellite payload management focuses on optimizing the payload—the core resource responsible for a satellite's primary mission.

Traditional satellites rely on fixed configurations and predefined resource allocations, while software-defined satellites (SDS) enable dynamic, in-orbit adjustments for greater flexibility. Resource allocation in SDS adapts to real-time demands, while configuration management allows payload settings to evolve based on mission needs. Data handling ensures reliable transmission to ground stations, with SDS incorporating on-board processing to reduce ground station workloads.

Effective payload resource control maximizes mission efficiency, ensuring satellites meet their objectives while adapting to changing conditions and user demands.

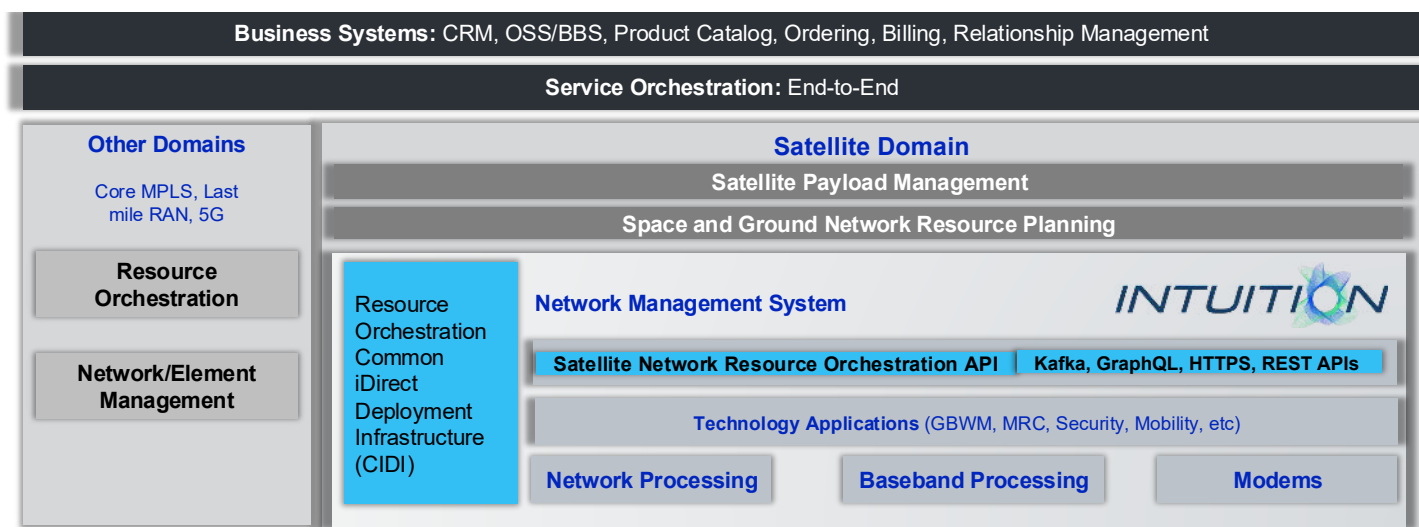
### Collaboration is Key

iDirect collaborates actively with partners in satellite network resource planning and payload management to achieve end-to-end solutions.

### READ MORE



## INTUITION'S RESOURCE ORCHESTRATION ARCHITECTURE



### THE ROLE OF THE NMS TO ENABLE RESOURCE ORCHESTRATION

The Intuition Network Management System (NMS) is a modular, cloud-native platform built for scalable, secure, and multi-tenant management of satellite networks. It serves as the integration point for resource orchestration by providing APIs and management capabilities that allow orchestration platforms to control ground segment assets. This design gives operators the flexibility to automate processes and align operations with business objectives, creating a foundation for end-to-end automation and operational efficiency.

### NMS API LAYER

The Intuition NMS exposes a comprehensive set of open APIs that enable seamless integration with orchestration platforms, OSS/BSS systems, and other operational tools. Through these standards-based APIs, operators can adjust configurations, streamline routine tasks, and trigger workflows based on real-time network events. This approach simplifies operations and enhances overall network efficiency.

The Intuition NMS API layer uses widely adopted technologies such as GraphQL, REST, and Kafka to enable critical functions including configuration control, performance monitoring, alert and event notifications, and telemetry streaming. These capabilities allow orchestration platforms to integrate seamlessly with satellite and terrestrial networks, ensuring interoperability and service delivery.

The NMS further enables orchestration with so-called southbound APIs that relay commands from the satellite payload to the technology applications and processing layers within the infrastructure.

## SATELLITE NETWORK RESOURCE ORCHESTRATION API

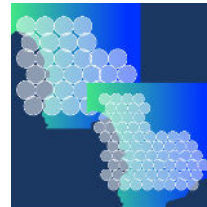
The Satellite Network Resource Orchestration API is a powerful suite of programmable interfaces designed to automate the management, coordination, and optimization of resources within the satellite ground segment. By enabling seamless communication between the ground system and other components of the satellite network, this API plays a critical role in ensuring efficient and reliable operations.

The primary function of this API is dynamic resource allocation, meaning it intelligently distributes bandwidth, power, and other critical resources based on real-time requests and operational priorities between ground and space segments. This ensures that resources are utilized effectively, even in the face of fluctuating demands or unexpected challenges. The API also emphasizes interoperability, ensuring smooth communication and compatibility between the ground system and external platforms. This capability is essential for integrating diverse systems and enabling cohesive operations across the satellite network.

Scalability is another key feature of the Satellite Network Resource Orchestration API. It is designed to support the expansion of ground system operations, allowing networks to scale dynamically in response to real-time demands. Whether managing a localized network or a global operation, the API ensures that resources are allocated efficiently to maintain optimal performance. Additionally, the API provides robust monitoring capabilities, delivering performance data to external systems for downstream decision-making. This data-driven approach enhances resource utilization and ensures the overall efficiency of the system.

By combining dynamic resource allocation, seamless interoperability, scalability, and advanced monitoring, the Satellite Network Resource Orchestration API empowers operators to manage their networks with precision and agility. It serves as a vital link between the ground segment and the broader satellite system, ensuring that all components work together harmoniously to deliver reliable and high-quality services.

## SATELLITE DOMAIN RESOURCE ORCHESTRATION USE CASES



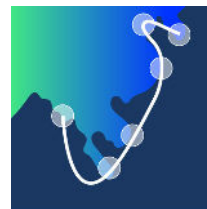
### Beam maps, bandwidth reconfiguration

- Maximize sellable capacity to fulfill services demand
- Reconfiguration of geographical or localized areas
- Develop spot beam patterns, frequency, band and carrier plans



### Ka/Q/V GW Diversity and Back-up

- Rain fade diversity schemes
- 1+1 GW switchover and smart diversity
- Backup GW switching



### On-demand orchestrated beam / services activation

- Resource activation at the target location
- Expand serviceable footprint without dedicated beam grid coverage
- Provide ad hoc tailored service



### Advanced Mobility dynamic resource allocation

- Spot beam utilized to follow mobility platforms
- Update resources allocation in the beam grid
- Fulfill traffic demand

## DYNAMIC COMPUTE RESOURCE ORCHESTRATION

Effective orchestration of satellite and ground resources requires more than network-level alignment. It depends on a flexible compute environment that can adapt to changing demands. Intuition provides this foundation through orchestration within a cloud-native architecture, ensuring that ground systems scale and remain resilient as satellite network services evolve.

The architecture uses containers and Kubernetes-based orchestration to enable dynamic scalability and flexible deployments. Intuition leverages Kubernetes to automate the management of containerized applications, allowing CPU, memory, and storage resources to scale horizontally across available nodes for real-time workload optimization.

This approach delivers operational resilience and service continuity. When a node fails, workloads are redistributed to other nodes without interruption. Resources are allocated based on actual requirements, reducing waste and improving overall efficiency.

## ACHIEVING DYNAMIC RESOURCE ORCHESTRATION

Resource orchestration is the cornerstone of modern satellite network operations, enabling operators to manage the complexity of space and ground segments with precision and agility. By dynamically coordinating assets, operators can optimize performance, enhance service reliability, and adapt to evolving demands in real time.

The Intuition NMS with its robust API layer and advanced orchestration features further empowers operators to allocate resources dynamically, monitor performance, and integrate seamlessly with external systems. Specifically, the Satellite Network Resource Orchestration API further enhances efficiency by enabling real-time resource management, interoperability, and scalability between the space and ground segment.

In a competitive and complex industry, resource orchestration equips satellite operators with the tools to maximize efficiency, ensure reliability, and deliver high-quality services, future-proofing their networks for evolving demands.

