

Service Name

AWS Ground Station

Service Overview

AWS Ground Station is a fully managed service that enables customers to control satellite communications, process satellite data, and scale operations without building or managing ground station infrastructure. The service provides secure, fast, and predictable satellite communications across a global infrastructure using AWS-managed antennas and ground stations. It eliminates the need for customers to build, manage, or scale their own ground station infrastructure, allowing them to focus on developing innovative applications using satellite data. AWS Ground Station uses a low-latency, high-bandwidth global fiber network to process satellite data within seconds of reception.

Key Use Cases

- **Real-time satellite data downlinking and storage:** Downlink satellite data in real-time or store it directly in Amazon S3 for immediate processing and analysis
- **Satellite command and control operations:** Uplink commands and data to satellites while performing Telemetry, Tracking, and Command (TT&C) functions for mission operations
- **Federal and defense space resilience:** Support government and defense organizations with secure, scalable ground segment solutions for national security and space operations
- **Earth observation and remote sensing:** Process large amounts of satellite imagery and sensor data for weather monitoring, agriculture, and environmental analysis
- **Software Defined Radio (SDR) applications:** Utilize SDR and Front End Processor (FEP) capabilities for advanced signal processing and custom satellite communication protocols

Features

- **Fully Managed Global Ground Station Network:** AWS-managed antennas and ground stations integrated with AWS Global Infrastructure across multiple regions worldwide
- **Multiple Frequency Band Support:** Supports X-band, S-band, and Ku-band satellite protocols with various modulation and encoding schemes
- **Pay-per-Minute Pricing:** Purchase antenna time in one-minute increments with no upfront costs or long-term commitments
- **Wideband Digital Intermediate Frequency (DigIF):** High-bandwidth signal processing capabilities for advanced satellite communications at select sites

- **Digital Twin Testing:** Test contact orchestration workflows against virtual ground stations for reduced costs and risk-free validation
- **Automatic Contact Scheduling:** Automated satellite communication session scheduling and management with up to 30 days advance booking
- **Customer-Provided Ephemerides:** Support for custom ephemeris data upload for antenna targeting during LEOP or orbital maneuvers
- **AWS Service Integration:** Direct integration with Amazon S3, EC2, Lambda, SageMaker, and other AWS services for data processing

Value Proposition

AWS Ground Station eliminates the complexity and cost of building traditional ground station infrastructure while providing up to 80% cost savings on ground station operations. Customers benefit from global reach without geographical constraints, pay-only-for-use pricing model, and seamless integration with the full AWS ecosystem for data processing and analytics:

- The service offers unparalleled flexibility with no long-term commitments, automatic scaling capabilities, and the ability to focus on mission objectives rather than infrastructure management
- Built-in security features, encryption, and compliance capabilities make it suitable for government and commercial applications

Service Integration

AWS Ground Station integrates natively with core AWS services to enable comprehensive satellite data workflows. Amazon S3 provides automatic data storage and archiving, while Amazon EC2 handles satellite command processing and data analysis:

- Amazon Kinesis Data Streams manages real-time data ingestion from satellites, and AWS Lambda enables serverless data processing and format conversions
- Amazon SageMaker supports machine learning applications on satellite data, while Amazon VPC ensures secure networking
- AWS CloudWatch provides monitoring and telemetry, AWS IAM manages access control, and Amazon SNS delivers notifications
- AWS KMS provides encryption services for data security

Onboarding and Offboarding

Customers begin by signing up for an AWS account and setting up appropriate IAM permissions for Ground Station access. The onboarding process involves satellite registration through data collection, technical validation, spectrum licensing, and integration testing:

- Customers must create mission profiles with tracking configurations and dataflows, then configure AWS resources like VPC, S3, and EC2 for data processing
- Contact scheduling requires valid ephemeris data and can be done up to 30 days in advance
- AWS provides comprehensive documentation, getting started guides, and console-based management tools to streamline the setup process

Getting Started Guide: <https://docs.aws.amazon.com/ground-station/latest/ug/getting-started.html>

Data Removal

The offboarding process involves canceling scheduled contacts, deleting mission profiles and satellite configurations, and removing dataflow endpoint groups. Customers can delete stored satellite data from Amazon S3 buckets and terminate associated EC2 instances. All Ground Station resources can be removed through the AWS console, CLI, or APIs, with no long-term commitments requiring formal contract termination.

Backup/Restore and Disaster Recovery

AWS Ground Station leverages AWS's inherent disaster recovery capabilities through its global infrastructure. Satellite data can be automatically replicated across regions using Amazon S3 cross-region replication. Mission profiles and configurations can be recreated in alternate regions using Infrastructure as Code. The service's distributed nature provides built-in redundancy through multiple ground station locations.

Backup Capabilities

AWS Ground Station does not have native backup capabilities but integrates with AWS Backup for protecting associated resources like EC2 instances and EBS volumes. Satellite data stored in Amazon S3 can leverage S3 versioning, cross-region replication, and S3 Glacier for long-term archival. Mission configurations should be backed up using Infrastructure as Code practices.

Disaster Recovery

AWS Ground Station supports disaster recovery through its multi-region architecture and integration with AWS services. The service does not directly integrate with AWS Elastic Disaster Recovery but benefits from the underlying AWS infrastructure's resilience. Customers can implement disaster recovery strategies using cross-region data replication and automated failover mechanisms.

Recovery Objectives

AWS Ground Station helps meet RPO and RTO objectives through its global infrastructure and real-time data processing capabilities. Cross-region data replication can achieve near-zero RPO for critical satellite data, while the distributed ground station network

provides multiple communication paths for improved availability. Automated contact scheduling and digital twin testing help ensure operational continuity.

Service Constraints

Service Quotas: <https://docs.aws.amazon.com/general/latest/gr/gs.html>

FAQ: <https://aws.amazon.com/ground-station/faqs/>

Technical Requirements

Service Documentation: <https://docs.aws.amazon.com/ground-station/latest/ug/index.html>

User Guide: <https://docs.aws.amazon.com/ground-station/latest/ug/index.html>

API Reference: <https://docs.aws.amazon.com/ground-station/latest/APIReference/Welcome.html>

Pricing Overview

Please see the AWS UK G Cloud 15 Pricing Document accompanying this service in the Digital Marketplace.

Public Pricing: <https://aws.amazon.com/ground-station/pricing/>

Cost Optimization

AWS Ground Station offers unique cost optimization through pay-per-minute pricing with no upfront infrastructure investment, potentially saving up to 80% compared to traditional ground stations. Reserved scheduling provides discounted rates for regular users with monthly commitments over 12 months:

- The digital twin feature allows cost-effective testing and validation without using actual antenna time
- Customers can optimize costs by scheduling contacts during off-peak times, using narrow-band communications when possible, and leveraging AWS's global network to select the most cost-effective ground station locations

Savings Considerations

Primary cost savings come from eliminating capital expenditure on ground station infrastructure, maintenance, and staffing. The pay-as-you-go model aligns costs directly with usage, avoiding fixed infrastructure costs:

- Reserved pricing offers additional discounts for predictable workloads, while the global network eliminates the need for multiple geographic installations

- Integration with AWS services reduces data transport and processing costs through optimized data paths
- Automated scheduling and management reduce operational overhead, and the shared infrastructure model provides economies of scale unavailable to private ground stations