



Commercialising Direct-to-Device Satellite Services in Canada

Transforming 3GPP NTN standards into a commercially deployable consumer service

CHALLENGE



Canada's geography leaves large areas outside terrestrial mobile coverage, creating connectivity gaps for consumers and businesses. While 3GPP Release 17 standardised Non-Terrestrial Networks (NTN), commercial consumer service requires more than satellite connectivity. MNOs need to integrate satellite communications with existing mobile business processes, operational systems and customer journeys while maintaining a seamless, terrestrial-like user experience.

SOLUTION



Terrestar Solutions developed a standards-based D2D satellite service that extends existing mobile networks beyond terrestrial coverage. Rather than creating a stand-alone satellite offering, the solution integrates satellite connectivity with customer onboarding, provisioning, subscriber management, billing, customer care and network operations through a unified commercial platform. Delivered in collaboration with satellite, device, chipset, application and mobile network partners, the service provides an operational framework for scalable nationwide deployment.

IMPACT & STATISTICS

Nationwide reach

Direct-to-device (D2D) architecture extends mobile communications to remote and underserved areas across Canada.

Multi-service capability

A single commercial platform supports SMS, voice, chat and email services.

Ecosystem interoperability

The solution integrates satellite, chipset, device, manufacturing, application, communications and mobile network technologies.

Commercial service launch

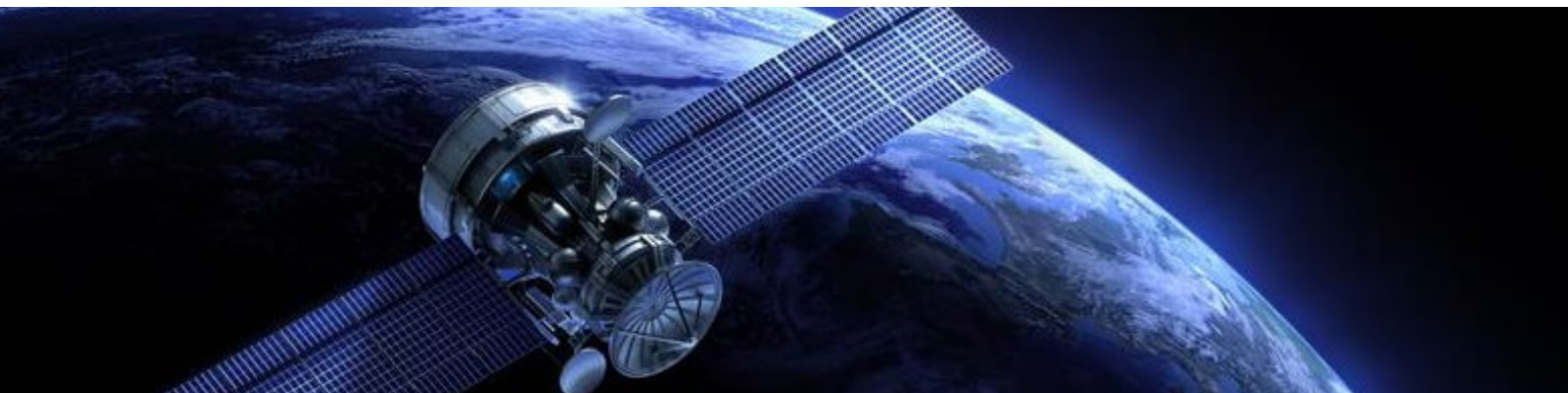
An end-to-end model supports consumer satellite services from onboarding to billing and network operations.

Scalable integration

Defined interfaces allow MNO integration with existing subscriber, provisioning, billing, customer care and service delivery systems.

Standards-based deployment

3GPP Release 17 NTN enables standardised device and network interoperability and migration to future NTN capabilities.



The GSMA NTN Community and MSSA are collaborating to share real-world NTN deployments and use cases contributed by MSSA member companies. As the integration of terrestrial and non-terrestrial networks advances, sharing practical implementation experiences helps drive industry understanding, ecosystem alignment, and standardisation.

THE JOURNEY FROM STANDARDS TO COMMERCIAL SERVICE

Terrestar Solutions Inc. (TSI) is a Canadian mobile satellite operator delivering standards-based direct-to-device (D2D) satellite communications. The solution demonstrates how 3GPP NTN standards can be transformed into an operational consumer service through integration with existing mobile networks, commercial platforms and customer operations.

Introduction

Background

Terrestar, Canada's mobile satellite operator, developed a consumer D2D service that complements existing mobile networks rather than replacing them by creating an ecosystem of satellite, chipset, device, application and network technology partners.

Use case context

The service enables consumers to maintain communications in remote and underserved areas where terrestrial networks are unavailable, while supporting future mobile applications beyond terrestrial coverage.

Technology rationale

NB-IoT NTN was selected to provide standards-based, low-bandwidth communications optimised for wide-area satellite coverage, enabling reliable messaging and voice services where terrestrial networks are unavailable.

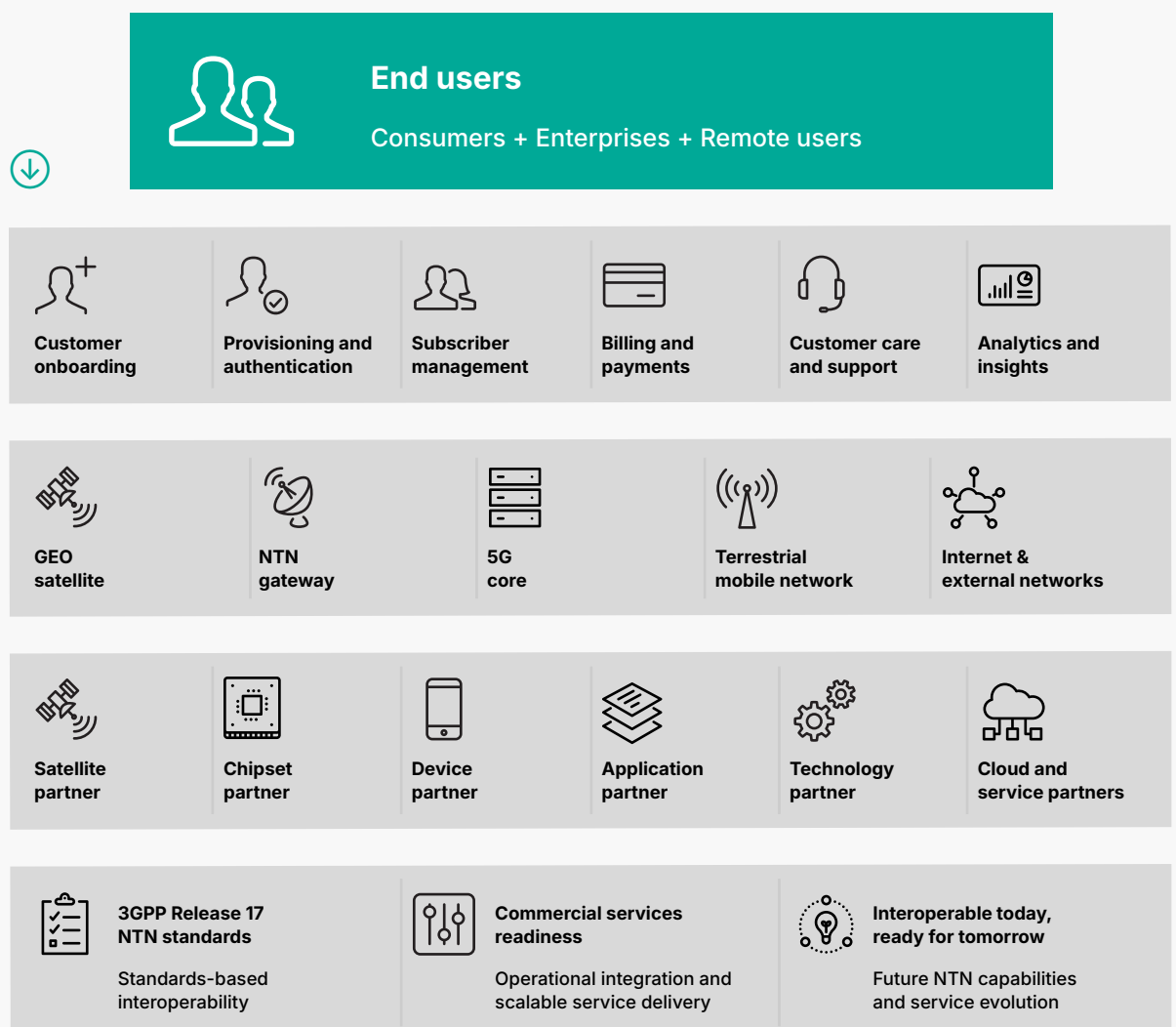
Objectives

The service commercialises satellite connectivity by integrating it into existing MNO environments, creating a scalable consumer service that can evolve alongside future NTN capabilities.

Figure 1

Source: Terrestar

Commercial D2D service architecture



Challenge

Beyond establishing satellite connectivity, commercialising D2D services required overcoming business, operational and technical challenges.

Business and strategic implications

Commercial viability depends on integrating satellite connectivity into established mobile service models. Without this, MNOs face more complex deployments, fragmented customer journeys, higher operating costs and barriers to consumer-scale adoption.

Operational issues

Satellite services need to integrate with provisioning, billing, customer care, network operations and service management.

Technical limitations

Interoperability is required across satellite infrastructure, devices, applications, subscriber management and mobile core networks.

Environmental constraints

Reliable communications need to be maintained across Canada's vast remote regions without terrestrial infrastructure.

Solution

Terrestar has brought satellite connectivity into the consumer mobile environment, integrating the satellite network with end-to-end services, from customer activation and service delivery to ongoing operations and support. This enables D2D connectivity to operate as a scalable consumer service, not a stand-alone satellite solution.

Technology overview

Terrestar provides the complete D2D service value chain, including subscriber management, provisioning, charging, customer care and service delivery, adaptable to an MNO's existing systems and commercial model.

Table 1

End-to-end D2D ecosystem

Source: Terrestar

CAPABILITY	TERRESTAR'S ROLE	MNO'S ROLE	INTEGRATION/INTERFACE
Satellite network	Operates NTN network and service infrastructure	Operates terrestrial network	NTN/network interworking
Subscriber and entitlement	Manages satellite service provisioning and entitlements	Provides subscriber eligibility/service information	Provisioning/entitlement APIs
Customer relationship management (CRM)	Provides D2D customer/service management capabilities	Retains customer relationship and existing CRM where applicable	CRM/customer APIs
Billing and charging	Supports D2D service charging and billing capabilities	Maintains MNO billing where applicable	Billing/charging interface
Service communications	Provides satellite-enabled communications services	Integrates with existing mobile service environment	Messaging/voice service interfaces
Customer care	Provides D2D service and operational support	Remains customer-facing support channel where applicable	Customer care/ ticketing interfaces
Digital experience	Provides application and back-end service capabilities	Supports MNO commercial model	Application/service APIs

Network architecture

User devices connect through Terrestar's GEO satellite and gateway infrastructure to its service delivery and commercial platforms. Terrestar manages the satellite network and D2D service environment, while interfaces with MNO systems support subscriber management, provisioning, service delivery, charging and customer care.

Hardware and devices

The solution leverages commercially available NTN-enabled devices and chipsets compliant with 3GPP Release 17 specifications. A mobile app supports service registration, authentication, provisioning, activation and account management, maintaining compatibility with the evolving NTN ecosystem.

System integration

A key differentiator of the solution is the integration of the commercial service environment with both the MNO ecosystem and the NTN network. Customer onboarding is through the applicable MNO or Terrestar channel, including registration, eligibility validation and D2D service selection. Orders trigger provisioning through APIs between MNO and Terrestar environments, coordinating SIM/eSIM activation, subscriber profiles, entitlements, device association and service activation. Subscribers and devices can then authenticate and attach to the NTN network when satellite connectivity is required, with service status and usage information flowing to commercial and operational systems to support billing, customer care, service assurance and subscriber management.

Partners and ecosystem

Terrestar's SatCompanion is a portable satellite device enabling compatible smartphones to access voice, messaging, chat and email when terrestrial coverage is unavailable. The solution integrates specialised chipset, voice codec, device, manufacturing, mobile network, communications and application capabilities within an end-to-end D2D service ecosystem. This multi-vendor architecture supports interoperability across the device, network and service domains while providing flexibility for continued NTN ecosystem evolution.

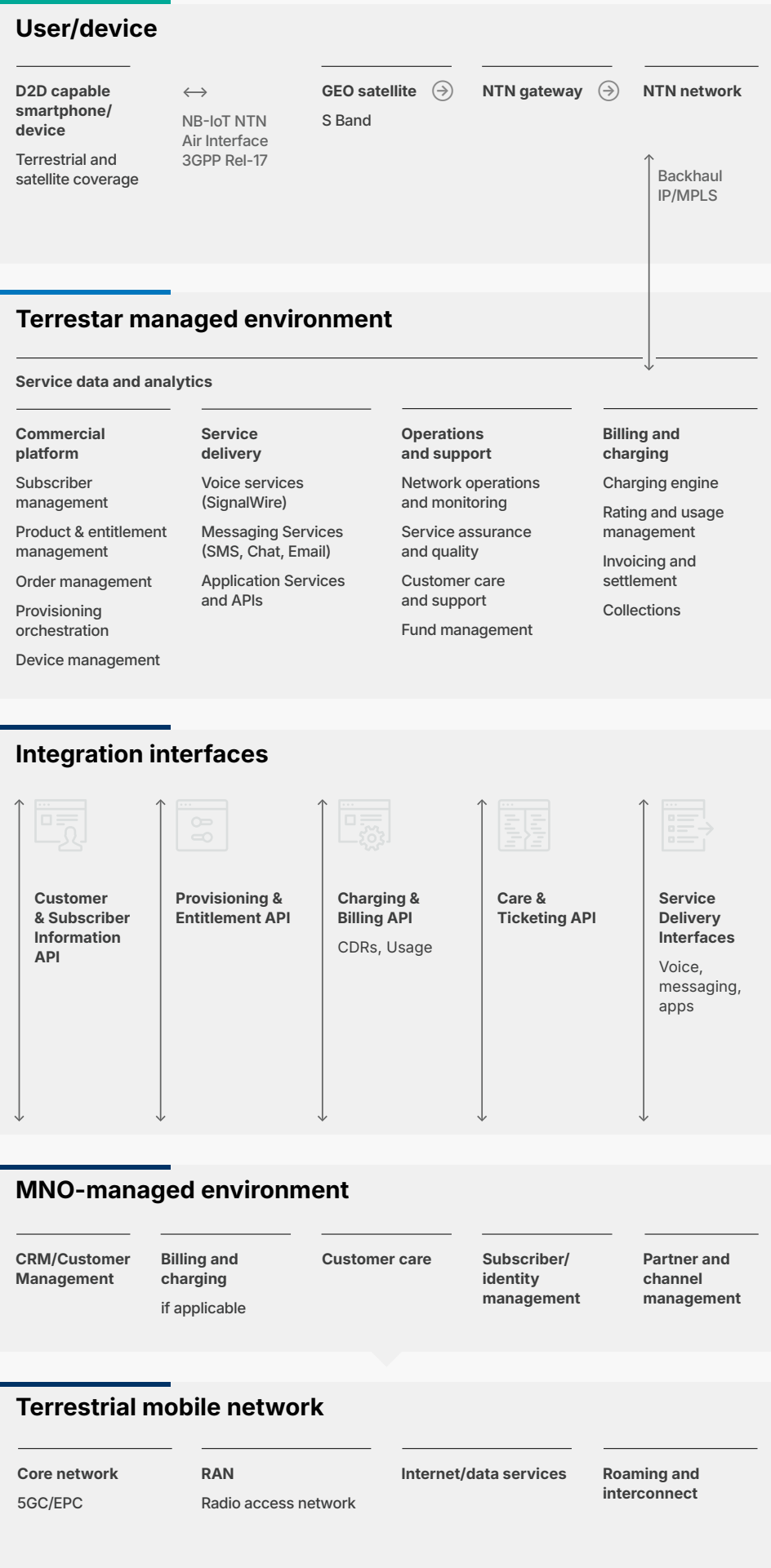
Standardisation compliance

The solution is based on 3GPP Release 17 NTN specifications, providing a standards-based foundation for interoperability across compatible devices, chipsets, satellite infrastructure, and network technologies. This approach supports continued evolution as the NTN ecosystem and future 3GPP capabilities mature.

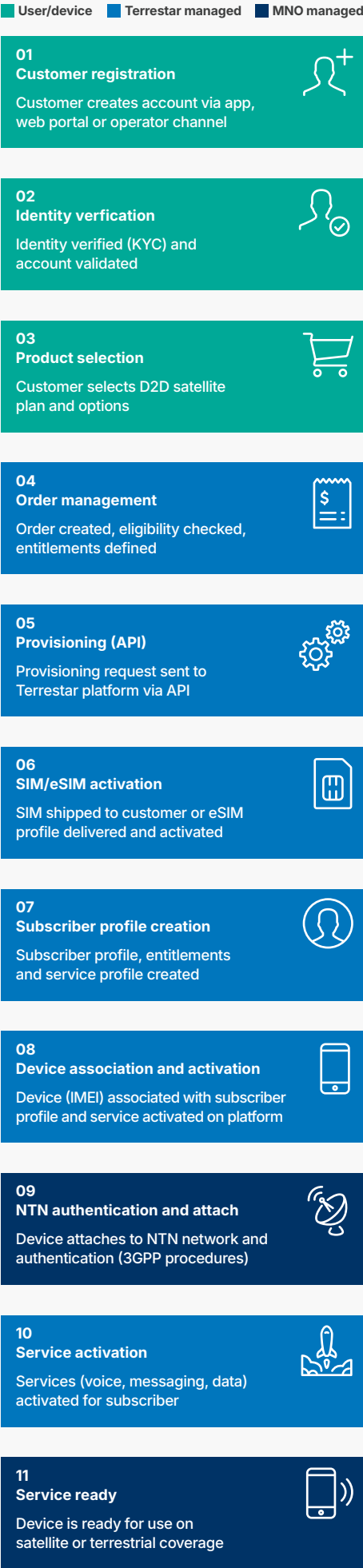


Figure 2
Terrestar D2D network architecture and end-to-end service integration

Source: Terrestar



Onboarding workflow



Impact & Benefits

Network coverage

The solution extends mobile connectivity to provide reliable communications across Canada’s remote and underserved regions. The scalable architecture supports nationwide service continuity and future NTN service enhancements.

Operational excellence

The integrated commercial platform streamlines customer onboarding, provisioning, activation, subscriber life-cycle management and operational support. Integrating satellite services with existing OSS/BSS and customer care processes simplifies operations and improves service consistency.

Business value

The solution transforms standardised NTN technology into a commercially deployable consumer service, enabling new service offerings and revenue opportunities for MNOs. A unified platform speeds service introduction while reducing the complexity of managing satellite and terrestrial services separately.

Social impact

The solution improves connectivity for remote communities, travellers and industries operating outside traditional mobile networks. A standards-based approach promotes ecosystem interoperability and supports broader adoption.

Future potential

Built on standardised NTN technologies, the platform supports service expansion across consumer and enterprise applications, evolving device capabilities and 3GPP NTN releases.

Figure 3

Source: Terrestar

Terrestar D2D commercialisation journey enablers

		JOURNEY	ENABLERS
	01 Standardised technology	Adopt 3GPP Release 17 NTN standards as the foundation for interoperable D2D connectivity.	• 3GPP 3GPP Release 17 NTN • NB-IOT NTN • Standards-based interoperability
	02 Satellite connectivity	Leverage GEO satellite infrastructure and NTN gateways to extend coverage beyond terrestrial networks.	• GEO satellite • NTN gateways • Core network integration • Terrestrial network
	03 Commercial platform integration	Integrate connectivity with commercial platform capabilities for onboarding, provisioning, billing, and subscriber management.	• Onboarding & provisioning • Subscriber management • Billing & payments • OSS/BSS Integration
	04 Customer operations readiness	Embed services into OSS/ BSS, customer care, and operational processes to ensure reliable service delivery and support at scale.	• Customer care • Network operations • Monitoring & analytics • Service assurance
	05 Commercial consumer service	Launch and operate Direct-to-Device services through consumer devices and mobile applications.	• Mobile app experience • Messaging & voice • Extended connectivity • Multi-device support
	06 Nationwide scale and evolution	Scale across Canada and evolve with future NTN capabilities and 3GPP releases.	• Nationwide coverage • New services & use cases • Ecosystem expansion • Future 3GPP NTN evolution

OUTCOMES AND BENEFITS

Extended coverage

Reliable mobile connectivity beyond terrestrial networks across Canada.

Operational excellence

Unified platform and automated processes improve efficiency and service quality.

Business growth

New revenue streams and service opportunities for mobile operators.

Enhanced experience

Seamless, reliable communications for consumers, businesses and remote users.

Future ready

Standards-based foundation ready for future NTN capabilities and innovations.

KEY TAKEAWAYS



Lessons learned

Successful commercialisation of D2D satellite services requires more than standardised NTN connectivity. Delivering a consumer-ready service depends on integrating customer onboarding, operational processes, commercial platforms and network technologies into a seamless mobile service experience.

Success factors

A standards-based architecture, close collaboration across the satellite and mobile ecosystem and early integration of commercial, operational and capabilities enabled the successful transition from technical standard to commercial service.

Scalability insights

The commercial framework can be extended to other MNOs, consumer services, enterprise applications and new geographic markets while leveraging the same standardised service architecture and operational model.

Future outlook

The platform provides a foundation for continued NTN evolution, including support for future 3GPP capabilities, additional consumer and enterprise services, expanded partner ecosystems and ongoing convergence between terrestrial and non-terrestrial mobile networks.

Industry significance

The project provides a practical blueprint for integrating standards-based NTN into established mobile service environments, demonstrating a path for MNOs to extend connectivity beyond terrestrial coverage without creating a separate satellite service model.



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We invite you to find out more at www.gsma.com →



The Mobile Satellite Services Association (MSSA) has a vision to integrate terrestrial and non-terrestrial networks (NTN) to deliver scalable, sustainable, and affordable connectivity to any device, anytime, anywhere.

Our Members work to develop and promote the value of satellite communications in mobile satellite bands, supporting seamless integration into a broad range of mobile devices for consumer, commercial, civil, and government applications.

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