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Report for GSOA

Regulating satellite connectivity across different operating models

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1 Executive summary

Satellite connectivity is becoming more capable, and more integrated with different forms of terrestrial networks, creating potential for new services and business models. Satellite connectivity supports wholesale capacity and backhaul, managed services for enterprise and government customers, broadcasting and direct connectivity to end users. Satellite communications services enable connectivity across geographies, particularly in underserved areas and for critical services in the enterprise and government sectors, including through land-, sea- and port-based applications.

In addition to this, satellite facilitates an emerging range of direct-to-device (D2D) services that may either extend a mobile provider's coverage or be retailed independently, for provision of voice and/or data connectivity to consumer devices, or for connection of sensors, vehicles, machines or other physical devices in the Internet of Things (IoT). Regulation should account for the capabilities and architecture of satellite technology and avoid being overly prescriptive, given the variety of existing and emerging innovative operating models through which satellite connectivity is provided.

1.1 Key findings

Satellite connectivity is ideally suited to fill connectivity gaps, complementing terrestrial fixed broadband and mobile services, alongside its traditional applications. Advances in constellation design and standardisation developments have significantly enhanced direct communications capabilities between satellites and end user devices, enabling standard smartphones and IoT devices to connect directly to satellites, and expanding the range of feasible services that satellite networks can provide. However, satellite capacity is deployed across broad geographies and remains constrained by power, capacity, latency and spectrum. Its strongest roles are to **complement terrestrial coverage**, add resilience and serve users or locations that terrestrial networks cannot reach economically or where the coverage is insufficient, support the safety-of-life functions provided for government, maritime, aviation sectors and for other industry and civilian customers.

Satellite networks have coverage capabilities and ground architectural characteristics that differ from those of fixed or mobile terrestrial networks. Satellite networks offer coverage designed to span multiple markets and regions, meaning they have a different cost structure to terrestrial telecoms networks, which are designed for individual markets. The regulatory requirements for terrestrial telecoms networks may assume domestically located infrastructure, information or technical capabilities that are not relevant for satellite network architecture. **It is important that regulation applying to satellite networks is suitable for their architectures.** This requires policy makers to consider the **outcomes they are seeking and how these can be achieved, including through alternative approaches.** An example of such an approach could be the use of regional or virtual gateways strategically located to provide continuous regional or global coverage.

This report identifies five broad satellite connectivity operating models, though not exhaustive, this illustrates how misaligned regulation can hinder deployment. The five operating models include wholesale backhaul and capacity, wholesale and partner-delivered services, integrated partnership D2D, direct targeted provision to consumer and enterprise end users via fixed-satellite service (FSS) or mobile-satellite service (MSS) infrastructure available only to dedicated satellite end-user terminals, and D2D to globally standardised devices via either MSS or International Mobile Telecommunications (IMT) spectrum. The models are not mutually exclusive and satellite operators may combine models within a country or use different arrangements across countries. New operating models also continue to emerge, and regulation should **remain flexible to accommodate, and respond to, this evolution**.

Different models present different regulatory implications in a market or region. In wholesale and partnership models, a locally licensed provider commonly holds the customer relationship, relevant service licence and customer-facing obligations. In direct retail models, the satellite operator assumes more of those responsibilities. As is the case with terrestrial networks, regulations apply differently at the wholesale level, compared to the retail level.

The key consideration for policy makers is that satellite architecture is regional or global by nature, while terrestrial regulation is predominantly national and designed to provide nationally deployed fixed or mobile terrestrial connectivity services. Space-segment requirements, including ITU filings and orbital co-ordination, apply across the five satellite operating models. Divergent national authorisations, local-establishment rules, infrastructure mandates, reporting requirements and fees risk creating additional costs in each jurisdiction. **Cumulatively, these may deter economic, technically feasible and socially valuable market entry.**

1.2 Recommendations for policy makers

National authorities should test proposed regulatory measures against key principles using a four-step process:

- **Step 1 – Necessity:** Authorities should first identify the regulatory outcome sought and then consider, given the satellite operating model, whether the outcome is already being delivered through existing measures, obligations imposed on an MNO, ISP, distributor or other locally licensed delivery partner. If regulation applicable to satellite networks is required, technical alternatives should be considered to meet the intended outcome. This avoids duplicative licensing requirements or obligations that may not improve regulatory outcomes.

- **Step 2 – Possibility:** Authorities should determine whether the proposed measure is feasible for the satellite operators in scope. Requirements should be framed around the outcome sought rather than prescribing terrestrial-style solutions that satellite networks may be unable to provide or that may not make technical or economic sense. Authorities should align with regional and international approaches and accept regional gateways, virtualised functions, recognised standards and cross-border co-operation where these provide the required assurance, including for traffic landing and lawful interception.

- **Step 3 – Proportionality:** The requirements imposed should reflect the provider's role, capabilities and scale of activity in a market. Relevant requirements should apply to the party providing the end-user service, distinguishing consumer retail services from wholesale services and from enterprise and government services supplied under commercially negotiated agreements. Where such requirements are warranted, they should be technology-neutral and framed around outcomes rather than prescribed solutions. Similarly, licence fees and sectoral contributions should use a basis that is technically feasible to determine under the relevant operating model. It is noted that subscriber or device numbers may not be available or provide a meaningful measure under wholesale or partnership models. Any resulting contribution should remain proportionate to the scale of the service provided.

- **Step 4 – Balance:** The incremental benefits of proposed measures should be weighed against their potential effects on market entry, coverage, resilience and service innovation. Measures should avoid undermining the wider connectivity and public-interest benefits that satellite services provide. This includes distinguishing D2D consumer emergency communications from specialised maritime, aviation and government safety communications, and recognising the public-interest role of each of these services.

Applying these principles effectively requires policy makers to have a sufficiently detailed understanding of:

- **The distinct characteristics of satellite networks and technology and their role in improving connectivity**, including whether the infrastructure, information and technical capabilities assumed by a proposed measure are available under the relevant satellite architecture.

- **The range of existing and emerging satellite operating models relevant to the jurisdiction**, including which party controls the relevant functions, possesses information, holds the customer relationship, and either carries obligations or pursues technical alternatives that may already contribute to the intended regulatory outcome.

Measures that do not satisfy these tests should be reconsidered before adoption. This approach allows authorities to secure regulatory outcomes without duplicating existing obligations, requiring technically infeasible solutions, or imposing burdens that do not reflect the satellite operator's role and scale. It would also preserve satellite connectivity's contribution to coverage, resilience and public safety, without imposing uniform obligations on different technologies and operating models.

2 Satellite has complemented terrestrial connectivity for decades – recent advances bring new possibilities

This section explains how satellite operators typically serve markets through wholesale and partnership arrangements, and how technical advances are raising new questions for regulation. Section 2.1 describes the established role of satellite operators in providing capacity to local partners and enterprise users, alongside the new possibilities created by different types of direct-to-device (D2D) connectivity provision currently being pursued by satellite operators together with terrestrial operators and/or other service distribution partners. Section 2.2 considers the regulatory questions arising from these advances and explains why the requirements applied to satellite operators should account for the operating model used.

2.1 Satellite operators provide connectivity through a range of business models

Satellite operators are instrumental to the improving global connectivity landscape, and have been for decades by providing communications capacity that is used in a variety of services by consumers and businesses, including television broadcasting, backhaul, trunking and home broadband via fixed satellite services, as well as global voice and data mobile services via mobile satellite services. Historically, satellite operators have provided capacity through wholesale agreements to intermediary telecoms providers (which in turn offer communications services to end-users), directly to telecoms providers for backhaul or trunking capacity within terrestrial networks, or to enterprise and government customers with specific and critical requirements (e.g. aviation, maritime, or land mobile connectivity). Satellite connectivity is also used to provide broadband connectivity and/or television services direct to consumers and businesses, and these services play a particularly important role for individuals or businesses who cannot receive broadband or television services via other means. D2D services are a more recent addition to the satellite market, and these services are already available today in some markets either directly via satellite companies and mobile device providers, via mobile network operators (MNOs) or other distributors. Some companies use capacity from satellite operators to either integrate into existing mobile networks or to offer D2D services directly to mobile users via compatible phones and specific D2D apps.

While satellite operators deploy ground infrastructure comprised of gateways, telemetry, tracking and command (TT&C) sites, and points of presence (PoPs), connected via fibre networks between markets, satellite operators do not always sell connectivity or services directly to end users. Regulatory and licensing requirements typically vary depending on whether the satellite operator is providing services directly to users or not. Due to the global nature of frequency allocations and use, satellite operators are subject to various requirements concerned with the use of orbital and spectrum resources, including international co-ordination through the International Telecommunication Union (ITU), the registration and authorisation of space objects under the United Nations space law instruments. In some countries, landing rights are still deployed as a means of registering satellite networks to operate in a market, although other countries do not have this requirement and operate on an ‘open skies’ basis. Other national authorisations such as national spectrum licences may also apply and be granted to satellite operators. Deployment of ground infrastructure is usually governed by ground network authorisations and may also require the satellite operator to hold a telecoms service licence.

Technical advances in satellite design, and technology standardisation allowing for more seamless satellite and terrestrial coverage integration is now enabling standard smartphones or IoT devices

to connect directly to satellites without the need for specialised equipment. Larger constellations and satellites, higher throughput and the ability to establish links with standardised mobile handsets or IoT devices have widened the range of services that satellite networks are able to support. This unlocks new opportunities for satellite coverage to be incorporated into a licensed mobile network architecture as an additional, complementary, coverage layer, or for D2D services to be provided directly to end users either by a satellite operator itself or via another third-party distributor. While these possibilities may reveal new business models, the technical capabilities and economics of satellite coverage suggest satellite connectivity will remain a complement to fixed broadband and mobile services rather than competing directly with it.

Where D2D services have been offered to end users by satellite operators directly to date, these have been limited to emergency or beyond terrestrial coverage messaging purposes. However, there are space-based mobile broadband D2D networks being deployed today and these should be in commercial service with MNO partnerships in early 2027.

2.2 Technical advances are raising regulatory questions

Technical advances in satellite connectivity, together with growing momentum associated with launch of new constellations, are prompting authorities to consider whether existing regulatory frameworks remain appropriate for the potential new operating models enabled by these advances in satellite connectivity and satellite-terrestrial integration. As satellite networks expand in capability, and with some services becoming more closely integrated with terrestrial networks, key questions arise over how frameworks should apply to a range of services, including LEO satellite broadband and D2D services.

These advances do not displace established satellite-capacity provision arrangements. Many satellite operators (including for D2D services) continue to provide capacity through terrestrial fixed network operators and MNOs, ISPs, distributors and other in-market service providers, as well as offering wholesale capacity, television broadcasting and connectivity to customers with specific global coverage requirements. Some satellite providers serve enterprise and government customers directly with specific connectivity requirements. Even where satellite capabilities expand, such partnership and wholesale models are likely to remain important for several reasons, including operational efficiency, existing customer relationships, service design and because the economics of satellite systems depend on using the same capacity across broad geographies. Technical advances nevertheless widen the range of potential operating models, including models through which satellite operators may serve more end users directly.

The regulatory requirements applicable to different commercial models depend on how functions and responsibilities are allocated between the parties involved. Where a locally licensed partner sells the service, manages the customer relationship and operates relevant domestic network functions, that partner may already be subject to service licensing, consumer protection, emergency services and other national regulatory obligations. In such a case, the satellite operator is typically responsible for approvals for the use of spectrum for the space segment, and any other associated rights needed to use the satellite infrastructure and to commercialise its use to local partners. Conversely, a satellite operator serving end users directly may be responsible for more of the end-user requirements itself.

This report therefore seeks to deepen authorities' understanding of the variety of satellite operating models used to serve consumers, enterprises and government customers, often for connecting rural, remote and hard-to-reach areas, and the differences between these models that have important implications for future satellite regulation, including how requirements can be tailored to account for the nature and scale of the services provided, even when satellite operators provide services directly to end users.

3 Satellite connectivity is delivered through various models, relevant to how regulation is applied

This section describes the different business and operating models that satellite operators use to deliver connectivity. Section 3.1 provides a brief overview of satellite network architecture and economics. Section 3.2 introduces five common operating models and describes the key value chain components along which these models differ. Section 3.3 then considers the relevance of each component to regulatory obligations, and implications for the different operating models.

3.1 Satellites cover multiple markets via the same constellation

Each satellite network can be broken into three different segments:

- The **space segment** refers to the satellites in orbit, the communications payload equipment they carry, and, in some systems, the inter-satellite links used to route traffic between spacecraft before it reaches the ground, either for coverage or resiliency reasons. The space segment operates under the ITU's satellite framework based on constellation filings and secured orbital rights; the coverage of a satellite system is determined by various parameters including the orbit selected (e.g. geostationary, medium or low Earth orbit), number of satellites in the constellation and network design parameters such as power and duty cycle.

- The **ground segment** refers to everything on the Earth's surface that is needed to facilitate the provision of connectivity, comprising the gateway earth stations, telemetry, tracking and command (TT&C) sites, points of presence (PoPs) through which traffic passes between the satellites and terrestrial networks, together with the core network functions that authenticate users, route traffic, and support lawful access. There is no technical need for ground segment infrastructure to be in every country served by a given satellite constellation (and it may not be technically possible to provide ground infrastructure in every market). However, where present, ground segment infrastructure is subject to national regulations for planning of gateway and PoP locations. Existing terrestrial infrastructure such as fibre, might also be used for interconnection.

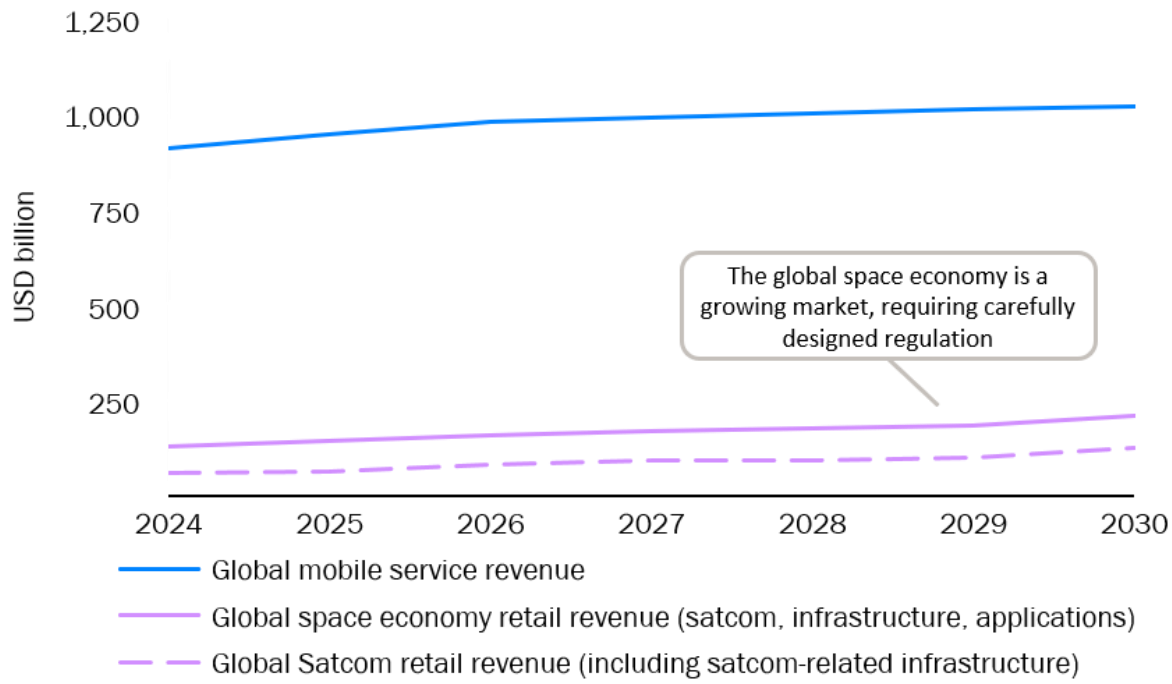
- The **user segment** refers to end-user terminals, devices or receiving equipment that connects to satellites, and can include fixed terminals installed at a household or a remote site, mobility terminals on a vessel, aircraft, or vehicle, or, in the case of D2D services, mobile handsets, IoT devices, and other compatible off-the-shelf user equipment.

The business models of satellite operators are naturally heavily focused on deploying space segment infrastructure for global coverage and meeting associated international requirements and technical standards. A single gateway earth station can carry traffic for users across a region spanning several countries. Where the satellite layer forms part of a terrestrial partner's network, core service functions often belong to that partner.

These characteristics shape the economics of providing connectivity from space. Satellite systems require substantial capital investment prior to service provision, and the resulting capacity tends to be regional or global in scope, meaning that the cost of the system effectively needs to be recovered through the revenue that can be generated across the collection of jurisdictions it covers. This allows satellite operators to earn revenue on a regional or global basis, by serving a relatively small share of users and traffic in a given market, offset by the geographic scale of the operation.

Despite new technical advances in satellite technology and in satellite-terrestrial integration, the share of traffic and market revenue expected to be delivered by satellite operators remains small relative to terrestrial counterparts (see Figure *3.1* for illustration of the scale that mobile service revenues have reached compared to an estimate of total global space economy revenues). This is consistent with how some terrestrial operators have characterised D2D satellite services as a complementary capability that can extend coverage in areas beyond the reach of terrestrial networks, rather than a substitute for the core services provided within terrestrial network coverage.[1]

Figure 3.1: Revenue forecasts for global mobile service and space economy [Source: Analysys Mason,[2] 2026]



International requirements for access to satellite orbits and frequency bands are largely co-ordinated between countries through regional and international co-ordination agreements, whereas national requirements (relating to provision of services into a market, and deployment of earth stations) may differ from one jurisdiction to the next. Fragmented national rules affect the cost of operating a constellation or satellite designed to cover multiple markets and regions, if it needs to comply with separate processes, instruments and obligations in each country. If national requirements differ significantly across countries, compliance costs may outweigh the benefit of entering some new markets entirely where it may otherwise be beneficial for satellite networks to operate.

1 SatNews (24 July 2026), *AT&T CEO Reaffirms Support for AST SpaceMobile, Dismisses Satellite Revenue Risk*. It is noted that it is possible to configure D2D services such that devices will only connect to the satellite network when a terrestrial signal is not available (e.g. VMO2's approach in the UK).

2 Based on Global space economy 2026: trends and forecasts (published on 21 May 2026) and Analysys Mason DataHub. Total global space economy retail revenue represents the sum of space-market verticals gathered from various Analysys Mason reports. Total satcom comprises global revenues for broadband access, civil government communications, commercial mobility, D2D and IoT, military communications, enterprise data, earth stations and satellite TV, as well as satcom-related infrastructure.

Jurisdictions with particularly onerous requirements are less likely to be viable for satellite operators to enter and may lead to that jurisdiction forgoing the connectivity benefits that satellite could bring (e.g. greater coverage, new services and providers leading to greater competition and choices for users). This is particularly concerning for countries which feature larger terrestrial coverage gaps and have much to gain from satellite coverage supplementing terrestrial networks. Understanding how satellite connectivity serves users in each country is necessary for setting obligations at a level that keeps beneficial entry viable.

3.2 Satellite operators use a variety of operating models

Satellite operators use a variety of operating models and may combine several within a country or use different arrangements across countries. For this report, we group the range of models into five broad categories according to how services reach end users and whether other parties are involved:

- **Wholesale backhaul and capacity**: The satellite operator supplies capacity or managed backhaul for another party's network or service. Wholesale customers may include telecoms providers, specialist service providers, device manufacturers, or enterprise and government organisations using capacity for their own connectivity purposes. A wholesale customer of a satellite operator may provide a downstream service or use the connectivity for its own operations. If the wholesale customer holds the end-user relationship and provides a service in the market, then it typically holds the relevant service licence. The satellite operator holds the relevant authorisations to launch and operate satellites, such as ITU filings, and landing rights or other national authorisations and licences (such as for deployment of transmitting earth stations, or use of spectrum) where required.

- **Wholesale and partner-delivered services:** The satellite operator sells broadband capacity to another party, which could be a locally licensed ISP or virtual ISP (vISP), telecoms provider or distributor/reseller. Arrangements may range from wholesale broadband provision to managed services and the sharing of satellite and ground infrastructure. The partner may package and retail the service, while the satellite operator may retain responsibility for network management, service performance or aspects of the customer relationship. The allocation of service authorisations, terminals, billing and customer support depends on the arrangement.

- **Integrated partnership D2D.** The satellite operator works with a terrestrial mobile operator, with the satellite layer providing a wider coverage footprint to that operator's network, effectively incorporating satellite connectivity into the MNO's end-user service. The mobile operator retails the service, bills the subscriber and manages network support. The satellite operator may require an authorisation of its own to provide connectivity into the market, depending on how the jurisdiction authorises the service. This model could involve terrestrial IMT spectrum held by the partner, or licensed MSS spectrum in L or S band, typically held by the satellite operator or by a joint venture vehicle established with its partner.

- **Direct provision to targeted consumer and enterprise end-user segments.** The satellite operator provides services directly to households, businesses or government customers, delivered to a dedicated satellite end-user device (which might be fixed or mobile). These may include household broadband and managed connectivity for enterprise sites, aircraft, vessels, vehicles, or IoT deployments, using FSS or MSS spectrum as appropriate. The operator holds the

end-user service relationship, although partners may assist with sales, installation or support. It holds whatever service authorisation the jurisdiction requires, and supplies the terminal, which is typically sold or leased to the customer. Several operators offer consumer services across jurisdictions; however, these do not generally compete directly with fixed broadband, with take-up concentrated in areas that fixed networks do not reach easily, and among users needing a backup if terrestrial networks fail (e.g. enterprise sites or public services). Meanwhile, direct enterprise provision should not be equated with mass-market consumer retailing, as service requirements and contractual arrangements may differ. Independently retailed D2D is considered separately below.

- **Independently retailed D2D.** The satellite operator provides a D2D service to individual end users independently of an MNO's retail offering. Distribution, device or support partners may still be involved, but the service is not retailed as part of the MNO's service. This model remains nascent. Where a satellite operator offers services to end users directly for provision of mobile voice and data services, it will be required to obtain whatever telecoms network and/or service authorisation each jurisdiction requires, alongside the spectrum access rights needed to reach handsets via compatible frequency bands. This model raises questions as to which obligations should apply where no locally licensed party sits between the satellite operator and the end user. As this model remains nascent, industry examples are sparse.

The categories are not exhaustive or mutually exclusive, and individual arrangements may combine features of more than one model. Further variations may emerge as technologies, infrastructure-sharing arrangements, and commercial relationships develop.

These models can be characterised by differences across key value chain components. The non-exhaustive table below compares five of such models. It is noted that functions may be allocated differently within each category, including where infrastructure is shared or services are managed jointly. Business models are evolving and so functions within models may also evolve.

Figure 3.2: Key differences between satellite operating models [Source: Analysys Mason, 2026]

Value chain component	Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to consumer and enterprise segments via satellite end-user terminals	Independently retailed D2D to globally connected terrestrial devices
Space segment	Rights of use are carried by the satellite operator in every case, comprising ITU filings for co-ordinated use in the relevant orbit and frequency band, space object registrations, debris mitigation and disposal commitments, and, if required, relevant authorisations to land traffic or use spectrum in a given territory.				
Spectrum	Uses FSS or MSS spectrum	Uses FSS or MSS spectrum	Specific to D2D, this approach might use MSS or terrestrial (IMT) spectrum in satellites in partnership with a national terrestrial operator (i.e. the terrestrial operator has the customer relationship)	Uses FSS or MSS spectrum connecting users to satellites via dedicated fixed or mobile terminals	Uses MSS and/or terrestrial spectrum held by the satellite operator to provide services directly to end users without a national terrestrial partner (i.e. the satellite operator has the customer relationship)
Ground based network and user devices	The satellite operator would deploy gateways, TT&C sites, and PoPs, sited regionally. The distribution partner operates the domestic network and terminals	Responsibility for ground segment and end-user terminals may be divided between the satellite operator and its partners, including through shared-infrastructure arrangements.	The satellite operator would deploy and control gateways, sited regionally, and interconnect via the partner's core network. Users have satellite connectivity via standard handsets.	The satellite operator would deploy its own gateways, PoPs and core functions, sited regionally, and supply the end-user devices at the customer premises or direct to customers	The satellite operator would deploy its own gateways, PoPs and core functions, sited regionally, with no terrestrial operator involvement. Users connect on standard handsets.
Customer relationship and distribution partnerships	The distribution partner holds the end-user relationship and, where it provides a service, the service licence if required	The partner may retail or package the service, while the satellite operator may retain aspects of the customer relationship or provide managed services. Customer support, billing and service authorisations	The mobile partner sells, bills and supports users under its own licence. The satellite operator may need its own authorisation either for use of spectrum or for provision of services into a market	No intermediary, so the satellite operator would hold the end-user relationship and service licence if required, and supplies terminals	No intermediary, so the satellite operator holds the end-user relationship and potentially the service licence if required, and spectrum authorisations.

Value chain component	Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to consumer and enterprise segments via satellite end-user terminals	Independently retailed D2D to globally connected terrestrial devices
		depend on the parties' respective roles.			
Scale of market activity	Set by contract with the distribution partner, with no direct exposure to end-user take-up	Set by contract with the distribution partner, with no direct exposure to end-user take-up	Potentially the partner's whole subscriber base, but satellite likely carries only a small share of the total traffic that the end-user devices generate (with the majority of traffic carried on terrestrial networks)	Household broadband generally serves areas underserved by fixed networks rather than competing directly. Enterprise services, including aviation, maritime and IoT connectivity, typically serve niche requirements and are governed by negotiated contracts.	The satellite operator would sell to customers directly who are using standard handsets.

The descriptions are illustrative rather than fixed. National authorities should establish the actual allocation of functions for the service and country concerned. Differences across these components have implications for the applicability and degree of relevant regulatory obligations, as discussed in the remainder of this section.

3.3 Regulatory frameworks should not impose one-size-fits-all obligations to different operating models

These components are relevant to policy makers in different ways:

- Satellite operators are subject to international space segment and orbital requirements regardless of the operating model used in terms of delivery of services to end users. The international rules require filing of technical details of the satellite system via the ITU's filings process.

- Requirements related to two of the components (customer relationship and distribution partnerships, and ground-based network) depend on operating model, particularly accounting for the nature of the service and if there is involvement of local national partners who provide the customer interface and who retail the services.

- The scale of an operator's activity (in terms of the market segments that it targets, and the services delivered to those segments), meanwhile, affects the regulatory burden it could reasonably be expected to bear in each country. National authorities must therefore account for this trade-off when calibrating obligations for the preceding components.

The table below sets out regulatory measures that are relevant to each component, and the resulting implications for how measures may be calibrated for different operating models.

Figure 3.3: Regulatory and operating model implications of key components [Source: Analysys Mason, 2026]

Component	Relevance to regulation	Implications for operating models
Space segment	• International requirements associated with use of orbital slots and frequency bands apply irrespective of the operating model used • There is a case for harmonising treatment of any national authorisations between neighbouring jurisdictions in a given region, recognising international ITU filings • There is also a case for granting authorisations to operate networks and/or services on a light-touch basis where a satellite operator does not sell services directly to end users (or may only do so via commercial agreements with specific enterprise or government customers)	• Divergent national processes add a fixed cost for each market entered under all five models, regardless of the number of users served • These costs weigh most heavily where the potential for a satellite operator to penetrate the market is limited, and affect how many jurisdictions an operator can justify serving from the same system
Spectrum	• Where satellite connectivity is being provided using FSS or MSS frequency bands, the methods for authorising use of frequency bands in national markets will be determined by the national regulator in line with well-established spectrum management approaches. A requirement for the satellite operator to have obtained an ITU filing for its constellation will usually underpin national requirements (i.e. satellite operators must have an active filing for the relevant frequency band and a satellite footprint over the market in question, since frequencies are subject to co-ordination with other constellations and with adjacent services) • Where terrestrial IMT spectrum is being used in satellites for D2D connectivity, regulations are still evolving, and co-existence implications of use of IMT in satellites with services in adjacent frequency bands is being studied for the upcoming ITU World Radiocommunications Conference in 2027 (WRC-27). Looking to markets where national regulators have already defined their own frameworks for use of terrestrial spectrum licensed to MNOs in space, a commercial agreement with the national spectrum rights holder (i.e. the MNO) is required, and avoidance of harmful interference to other mobile networks using neighbouring frequency bands, and networks using the same frequencies in neighbouring countries needs to be controlled • For MSS L-band and S-band spectrum, current authorisations for these bands are typically held by satellite, rather than terrestrial, operators, since these frequency bands are used for various international mobile services such as	• A partnership model to use terrestrial spectrum in space can be pursued where a terrestrial partner is able to share a portion of its existing licensed spectrum rights. In this case, the partner's licence conditions govern how that spectrum is used. Use of terrestrial bands in space will be further discussed globally during WRC-27 • MSS spectrum has been used over many years for a range of services including maritime, aviation and land mobile services to dedicated satellite devices. In some markets, spectrum licences to use MSS frequency bands are subject to finite licence durations, which in some markets are approaching expiry. Various regulators are currently consulting on renewal of MSS authorisations due to existing licence expiry (e.g. MSS 2GHz band in Europe, and in Australia) • Differences in regulatory frameworks and uses between IMT and MSS spectrum mean that authorisation conditions and fees developed for IMT spectrum should not be applied directly to MSS spectrum without considering the distinct rights involved, the services supported and the scale and characteristics of the satellite service.

Component	Relevance to regulation	Implications for operating models
	maritime, aviation and defence. The ownership of MSS spectrum licences has been the subject of much market activity recently and regulators in several markets are currently consulting on renewing legacy authorisations, raising questions over future authorisation approaches and conditions	
Ground-based network and user devices	• Requirements such as infrastructure licensing, planning consent and lawful interception apply to assets that are physically located within a jurisdiction • Where the satellite operator deploys these assets, requirements would be better framed around the outcome sought (e.g. lawful access), given that this can often be achieved at either a regional gateway earth station or a PoP • User terminal licensing may involve equipment type approval, conformity with technical standards, individual terminal registration or licensing, or authorisation through a blanket licence, class licence or licence exemption	• Where core network functions sit with a distribution partner, conditions placed on the satellite operator may duplicate existing obligations • Gateways may serve users across multiple countries and therefore need not be located in every country served; moreover, establishing a gateway may not be technically feasible in some areas/jurisdictions • Individual terminal registration may be feasible where a satellite operator supplies a limited number of terminals to known customers, but not where terminals are deployed through a local distribution partner or where D2D services connect through standard mobile devices already in circulation. In these cases, blanket or network-level authorisation may be more appropriate
Customer relationship and distribution partnerships	• Service licences, and the retail duties attached to them, generally apply to the party that sells the service and holds the end-user relationship, depending on the requirements of the jurisdiction • Where that party is already licensed and subject to the relevant obligations, national authorities should consider whether varying its existing authorisation would avoid imposing duplicative requirements on the satellite operator	• Wholesale and partnership models can operate without the satellite operator establishing a retail function in the market, since the distribution partner likely already carries the relevant retail duties • For retail models, satellite operators may hold end-user relationships, set prices and be subject to retail duties; however, they may not operate at the same scale as a terrestrial operator due to limitations in satellite power, capacity and latency, as set out in this report. Any such obligations should account for technical differences and the scale of market activity • The allocation of responsibilities may vary within each model. A partner's involvement does not necessarily remove the satellite operator's customer-facing role, while direct enterprise services are typically governed by negotiated contracts rather than consumer retail terms

Component	Relevance to regulation	Implications for operating models
Scale of the operator's activity	• The scale of an operator's activity in a country may vary considerably across operating models (in terms of the market segments targeted and the revenue generated from the traffic served) • Regulatory measures should account for these differences and avoid imposing burdens that are disproportionate to the operator's level of activity in the country	• Household broadband generally serves areas underserved by fixed networks rather than competing directly with them. • Enterprise services, including aviation, maritime and IoT connectivity, typically serve niche requirements and are governed by negotiated contracts. • Under wholesale and partnership models, contracts may be regional, so satellite operators may have limited visibility. • Independent D2D could in principle reach national scale, and obligations could be revisited if and when that scale is reached

The obligations that a satellite operator is subject to in each market will depend on the business and operating model used. Where a wholesale customer or service partner already meets obligations that secure the relevant outcome, equivalent requirements on the satellite operator may be duplicative and add cost without necessarily serving improved regulatory outcomes. The trade-offs between role-differentiated and integrated licensing are examined in the ITU's NGSO licensing framework toolkit, which describes how separating capacity and retail roles can reduce administrative demands and focus supervision on customer-facing providers (assuming a competitive retail market), while a combined licence may simplify enforcement across the value chain but risks overlapping requirements and deterring entry.[3]

Similar considerations apply to other components as well. For instance, if a satellite operator uses a model where ground segment infrastructure is provided by a domestic terrestrial partner, then requirements to deploy new in-country infrastructure may be unnecessary, particularly since lawful interception and localisation concerns would be addressed by obligations already placed on the terrestrial partner.

Meanwhile, operating models where satellite operators serve end users more directly may require (possibly new) measures to ensure that regulatory outcomes regarding service quality and consumer protection are met, although these measures should account for technology-related differences and be calibrated to reflect the scale of penetration and adoption of services in the market, and the degree to which the satellite service is competing directly with existing terrestrial operators. Direct enterprise services, including managed services, typically address specialised requirements through negotiated contracts and should not automatically be treated in the same way as consumer retail services.

Some authorities examining these questions are starting to reach similar conclusions, such as when Ofcom avoided duplicating obligations when it authorised D2D partnerships in the UK.

Case study: Authorising D2D partnerships in the UK

In 2026, Ofcom authorised VodafoneThree to offer satellite connectivity to its own subscribers in areas without terrestrial mobile coverage, using satellite-based connectivity provided by AST SpaceMobile. Vodafone and AST SpaceMobile's partnership is the second such partnership in the UK, with VMO2 partnering with Starlink Mobile.

Rather than requiring AST & Science, LLC (AST SpaceMobile) and Starlink Mobile to obtain a separate network operating licence, Ofcom varied the mobile licence already held by VodafoneThree in the 900MHz band (and 1800MHz for VMO2), and exempted handsets under the Wireless Telegraphy (Direct to Device Satellite Communications) (Exemption) Regulations 2026. Where D2D services are retailed via the MNOs, the MNOs retain the direct relationship with end customers and remain responsible for complying with the applicable retail-facing general conditions (e.g. billing, complaints handling and access to emergency services).

[3] International Telecommunications Union, *Non-geostationary satellite orbit (NGSO) licensing framework toolkit*

This approach reflects the fact that the satellite layer complements an existing licensed network as opposed to operating as a separate retail service and avoids duplicating obligations that the partner mobile operator is already subject to.

With regard to spectrum, where D2D service uses spectrum licensed to a national terrestrial operator with the MNO's consent (e.g. under an integrated partnership D2D model), the conditions attached to the MNO's terrestrial spectrum licence already govern how the spectrum is used, and separate spectrum-related obligations for the satellite operator would be contradictory and add little to no benefit. The situation is different where satellite operators require their own MSS assignments to provide services directly to end users, since the method used to assign that spectrum can affect whether entry is viable.

For national authorities, identifying operating models in use, or that could be deployed to serve their territories, is crucial for ensuring that satellite regulation is properly calibrated. The next section sets out the areas of national regulation that could apply to satellite operators and considers how each of them should be assessed once relevant operating models are properly understood.

4 Regulations should consider network architectures, outcomes and incentives

This section sets out the areas of national regulation that apply, or could apply, to satellite operators and considers how requirements should be designed considering the operating models described above. Section 4.1 distinguishes between requirements permitting services in a market and those specific to retail connectivity services. Section 4.2 then considers the primary objectives that these requirements are intended to achieve, the implications of those objectives for policy design, and why the resulting considerations should be applied to the operating models used in practice.

4.1 Regulations for communications service providers cover a broad set of areas

The requirements considered here are those imposed by national authorities and focus on what a satellite operator must do to provide services in a market and how users are served, as distinct from the international requirements and technical standards described in Section 2.1, which apply to a satellite system as a whole.

4.1.1 Market access requirements

These requirements establish the basis on which a satellite operator becomes a service provider in a national market, and generally take the form of a licence, an approval, a certification, a notification or an exemption. These include:

- **Operator-related licensing:** This covers authorisations that a satellite operator may need to provide space-based communications services, use relevant spectrum, provide communications services to end users and/or deploy ground segment infrastructure. Approaches vary considerably, with some jurisdictions operating a formal authorisation process under which each system is approved individually, and others adopting an 'open skies' or light-touch approach that requires no separate authorisation. Spectrum authorisations determine the right to use frequencies for delivering connectivity, while telecoms service licences determine whether an operator is authorised to provide communications services to end users, and which services may be provided. End-user service provision requirements may apply to the satellite operator, its local partner, or not be required where the operator only provides wholesale connectivity. This category also covers requirements applying to ground segment assets deployed by satellite operators, including regional gateway earth stations, teleports and points of presence, such as site licensing, planning consent, rights of way and site-related technical conditions.

- **User terminal licensing:** This determines whether satellite terminals and satellite-enabled devices may be placed on the market, installed and operated. Requirements may include equipment type approval, conformity with technical standards, individual terminal registration or licensing, or authorisation through a blanket licence, class licence or licence exemption. The appropriate approach depends in part on the equipment concerned, which may range from fixed broadband terminals and mobility terminals to standard handsets connecting to D2D services.

- **Corporate entity requirements:** If relevant, there may be legal and fiscal presence an operator must maintain locally if space-based services are being provided by the satellite operator directly to end users. These could range from incorporating a subsidiary to registering a branch or appointing an authorised representative, as well as associated domestic employment and tax-registration requirements. Conditions vary widely, extending in some jurisdictions to the nationality of directors, minimum staffing levels and committed investment. They can also arise indirectly where satellite services are authorised under a general telecoms service licence, which features conditions aimed at wireline retail services, such as maintaining a sales office, local telephone number or published tariffs, even where the operator has no subscribers of its own.

- **Licence fees and sectoral contributions:** If relevant, these might cover fees associated with operating end-user services in the market, including application and authorisation fees, annual regulatory fees, spectrum charges and contributions to universal service or other sectoral funds. They may be set as fixed charges, calculated by reference to revenue or assigned spectrum, or combined across several authorisations. Their effect depends on whether the operator earns identifiable national revenue and on the scale to which its services penetrate the market.

4.1.2 Service provision requirements

These requirements concern how a service is delivered once an operator is active in a market. These are generally framed in terms of a capability that needs to be available or an outcome that needs to be achieved, and they continue to apply for as long as the service is offered. How they apply will depend on the operating model and the roles of the parties involved. In particular, where satellite connectivity is incorporated into an integrated service provided by an existing licensed terrestrial provider (e.g. an ISP or MNO), requirements already applying to that provider should not be duplicated for the satellite operator. Instead, contractual arrangements should allocate responsibility for functions each must perform to ensure that requirements are met. These include:

- **Cyber security:** These concern how the integrity and security of the network are maintained. They may relate to network and information-system security, access controls, incident management and the resilience of relevant infrastructure and network functions. How these are provided depends on where those functions sit, and locally licensed partners, where relevant, may already hold associated obligations.

- **Lawful access and localisation:** These requirements concern how authorised authorities can obtain lawful access to communications, how relevant data is handled, stored or made accessible or local establishment. Though not necessary, some national authorities may apply measures relating to the location of gateways, points of presence or other network functions, as well as device/terminal authorisation requirements. How these are provided depends on where the relevant network functions sit, and locally licensed partners, where relevant, often hold associated obligations.

- **Service quality and consumer protection:** These govern outcomes for users, covering the accuracy of information provided at the point of sale, fair billing, complaints handling and redress, contract terms, and the publication of meaningful service quality information. They are duties owed to a customer and typically arise only where a party holds a direct relationship with retail customers in the market. For wholesale capacity providers, therefore, it would be the

service provider to the end users who fulfil these requirements and not the wholesaler. This may need to be reviewed if the wholesale provider later develops a direct relationship with end users. For enterprise and government managed services, negotiated contracts may already address service performance, support and remedies. National authorities should consider these arrangements when assessing whether additional requirements are needed.

- **Emergency services provision:** These cover emergency call routing, the provision of caller location information and the delivery of public warning messages. Such requirements generally apply to the provider of the relevant end-user communications service and would not usually apply directly to a provider of wholesale satellite capacity or satellite broadband services that do not include functionality through which users can contact emergency services. Their application depends heavily on network architecture, since functions that existing frameworks tend to assume are available, such as network-based location, may sit with a partner, be performed outside the jurisdiction or not be available at all. In many countries, satellite already provides a means of emergency response when terrestrial networks are unavailable, so additional obligations may not be necessary if the underlying regulatory objective is already met. Assessment should also recognise the public-interest role of specialised maritime, aviation and government safety communications, distinguishing these services from consumer emergency calling.

4.1.3 The nature of regulatory objectives should inform the design and application of requirements

In practice, satellite operators consider market entry requirements as well as service provision requirements when deciding whether to enter a market, and the operating model that they should use. This means that a separate lens for analysing these regulatory areas is needed to provide guidance on how onerous each requirement needs to be or the entities that they should apply to. As discussed further below, this can be done by considering the nature of the regulatory outcome that measures are intended to produce.

4.2 Policy design can be informed by state obligations and market function

The areas set out above can also be grouped by the objective that drives them:

- **State control-driven requirements** are typically considered with the intention of helping preserve the state's ability to enforce national regulations, to manage the nationally allocated resources that networks use, and/or to maintain lawful access. Telecoms-related licensing and user terminal licensing fall into this group, as do cyber security and lawful access and localisation requirements, which preserve access, oversight and the ability to make national rules effective.

- **Market functioning-driven requirements** concern the satellite operator's role in delivering services in the domestic market where relevant. Corporate entity requirements and licence fees and sectoral contributions address legal and economic relationship with the jurisdiction, while service quality and consumer protection and emergency services provisions address outcomes associated with serving users.

Among market entry requirements, telecoms-related licensing and user terminal licensing are driven by the state's control of its own resources and territory, whereas corporate entity requirements and licence fees and sectoral contributions are related more to the operator's standing in the domestic market. The same division applies for provision-related measures. Grouping regulatory measures by the intersection of these two lenses produces the matrix below.

Figure 4.1: Areas of national regulation, sorted by type and objective [Source: Analysys Mason, 2026]

Primary objective category	Entry-related measures	Provision-related measures
State control-driven	• Telecoms-related licensing • User terminal licensing	• Cyber security • Lawful access and localisation
Market functioning-driven	• Corporate entity requirements • Licence fees and sectoral contributions	• Service quality and consumer protection • Emergency services provisions

4.2.1 Regulatory objectives give rise to different considerations for policy design

The distinction between these two primary objective categories also affects the considerations that should inform how individual requirements are designed and applied.

For **state control-driven requirements**, the main consideration is the baseline outcome that the state needs to secure, whether existing obligations already secure it and, if further intervention is needed, whether the proposed measure can be applied under the relevant network architecture. This requires authorities to tailor requirements to differences in operating model and network architecture:

- Additional obligations may not be **necessary** where relevant outcomes are already secured through obligations placed on other parties: In wholesale and partner-delivered services and integrated D2D partnership models, the end-user relationship often sits with a separate domestic licensee that sells and supports the service, operates relevant core network functions and is subject to obligations attached to its national licence. Where those obligations already secure the relevant security, oversight or lawful-access outcome, imposing equivalent requirements on the satellite operator may duplicate existing arrangements and add cost and complexity without providing meaningful additional assurance. Authorities should therefore identify any remaining gap before placing a new obligation on the satellite operator, since an additional measure would only be necessary if the relevant outcome is not already secured.

- New measures may also not be **necessary** where the intended outcome can be secured through less burdensome means. Satellite operators deploy infrastructure based on architectures designed to serve multiple countries or regions, and the location or form of a particular network function does not necessarily determine whether the underlying regulatory outcome can be achieved. For instance, lawful interception can be supported through virtual gateways and regional points of presence without requiring a physical gateway earth station in every country served. Authorities should therefore assess whether such alternatives provide the required level of assurance and are **technically feasible** under the relevant satellite architecture, since mandating a specific technical solution would only be necessary where the outcome cannot be secured through a less burdensome alternative.

- Measures should be practically **possible and technically feasible** to comply with given the equipment and functions controlled by the operator: Certain requirements may assume a level of control that does not exist under some operating models, and may be excessively burdensome if improperly calibrated. Individual terminal registration, for example, may be feasible where a satellite operator supplies a limited number of terminals to known customers, but not where

services are provided on a wholesale basis through a local distribution partner, or where a D2D service connects through standard mobile devices and plans retailed by an MNO. In either circumstance, the satellite operator may not have the information or control needed to register each device before it connects. Authorities should therefore consider whether blanket or network-level authorisation could be used instead, since individual registration may not be possible where the operator lacks the information or control needed to register each device.

For **market functioning-driven requirements**, the design of measures should reflect the role that the operator plays domestically, the scale at which it penetrates the market, and the burden that operators could consequentially carry, given role and scale. Authorities should calibrate these measures while preserving incentives for beneficial entry:

- **Measures should use a basis that is technically feasible to determine under the relevant operating model:** For example, licence fees and sectoral contributions should be calculated using a basis that is technically feasible to determine under the relevant operating model. Subscriber or device numbers may be more appropriate in some cases, but the same approach may not be **possible** where a satellite operator does not know how many devices use the capacity it supplies. These measures may also be difficult to interpret consistently. For example, a single customer may account for many devices on an aircraft, across a fleet or within an Internet of Things deployment, while roaming D2D users may not have a stable relationship with the country concerned. National authorities should therefore select measures that are technically feasible for each relevant operating model or, where none is feasible, use a simpler basis that remains proportionate to the scale of service, such as a low flat fee or a cost-based charge.

- **The regulatory burden of a given measure should be calibrated against the scale of market penetration:** This is particularly relevant to corporate entity requirements and licence fees and sectoral contributions. Satellite operators often serve a small share of users and traffic in a given country, relying on providing services in multiple countries in order to recoup their investment. The extent to which a given obligation varies with market penetration is thus an important consideration, since measures such as flat licence fees, universal service contributions set at levels appropriate for national operators, and requirements to incorporate in every market served, may apply irrespective of the number of users served, unlike levies calculated as a share of turnover. Local incorporation provides a useful illustration, as the associated costs, including directors, audit and annual filings, may be prohibitively high relative to the potential for the satellite operator to penetrate the market, whereas an authorised representative would similarly offer accountability and a route for addressing complaints at less burdensome cost. Measures would be **proportionate** if their impact on a satellite operator reflects the nature and scale of the service that it provides.

- **Proposed instruments should also be assessed against the policy benefits that may be lost if the measure makes entry less attractive**: Emergency services provision provides one example, as where satellite extends a terrestrial provider's coverage, separate obligations on the satellite operator may add little and could weaken the case for launching the service if requirements are too onerous. The appropriate approach may differ if a satellite operator were to serve customers directly at national scale, since users may then expect comparable public-safety outcomes compared to using a terrestrial network, although it may be premature to subject operators to similar obligations before that scale is achieved. Licence fees and sectoral contributions raise a

related question, particularly where universal service funds have already been collected but not used efficiently. In very remote areas, satellite would be significantly less expensive to deploy than fibre, and in cases where terrestrial projects have exceeded forecast costs, or funds remain unused, authorities could consider whether allocating existing funds to satellite would close terrestrial coverage gaps more efficiently. Measures would be more **optimal** where they secure emergency services provision and universal service outcomes without discouraging satellite entry that would improve rural coverage, resilience and emergency reach.

Taken together, these considerations suggest that authorities should first assess whether proposed measures are suitable for the relevant satellite technology and applicable operating models, and then whether they are necessary to secure an outcome not already delivered, possible to comply with, proportionate to the operator's role and scale in the market, and well-balanced against wider policy benefits that could be lost if entry is deterred.

4.2.2 These considerations should be applied to the operating models used in practice

These examples demonstrate why obligations need to be tested against operating models actually used in the market. This includes variations within the models and arrangements that combine features of more than one. New obligations may duplicate requirements where wholesale or partnership models are used, while measures that may be suitable for players operating at national scale may be prohibitive for a satellite service with low market penetration. Section 5 sets out a practical process through which authorities can first assess whether a proposed measure is suitable for the relevant satellite technology and applicable operating models, and then whether it is necessary, possible to comply with, proportionate and well-balanced.

5 Regulators should tailor measures for satellite network and operating models to meet regulatory principles

This section sets out a process for calibrating regulatory obligations for satellite networks. National authorities should develop a firm understanding of relevant satellite networks and operating models, and test whether proposed measures are necessary given existing obligations and arrangements, possible to comply with for models in scope, proportionate to the nature and scale of operators' market activity, and well-balanced with respect to broader policy objectives.

5.1 Regulatory measures should be appropriate for satellite network and relevant operating models

National authorities should develop a firm understanding of the context in which a proposed measure would apply, including the capabilities and architecture of the relevant satellite network and the operating model through which the service is provided.

Satellite operators might use different operating models across the jurisdictions they serve, and a satellite operator could potentially sell wholesale capacity to a licensed provider in one country, support D2D service in another, and sell broadband directly to households elsewhere. A satellite operator may also use different operating models within the same jurisdiction, for example by providing satellite broadband directly to consumers, providing capacity or managed services to enterprise customers, and supporting D2D services through partnerships with terrestrial MNOs or other delivery partners. Understanding the model(s) used in a given market allows authorities to identify what specific regulatory outcomes require, and the entities that are best positioned to deliver those outcomes. In many cases, a locally licensed partner will already hold relevant obligations, and imposing additional requirements on the satellite operator would add cost without necessarily improving outcomes.

Developing this understanding requires authorities to consider two related aspects:

- **Satellite network architecture and capabilities.** Requirements carried across directly from terrestrial frameworks may assume that functions relevant to cyber security or lawful access and localisation are located domestically. However, satellite networks often deploy infrastructure based on network architectures designed to serve multiple countries or regions, and the location or form of a particular network function does not necessarily determine whether the underlying regulatory outcome can be achieved. Measures may also assume information, network functions or technical capabilities that are not available under the relevant satellite architecture. Individual terminal registration, for example, may not be technically or practically possible where a D2D service connects through standard mobile devices already in circulation. Authorities should therefore consider whether the targeted outcome can be achieved through the infrastructure and network functions available under the relevant satellite architecture, including through alternatives such as virtual gateways, regional PoPs and blanket or network-level authorisation.

- **Allocation of functions under the operating model.** The components set out in Section 3.2 provide a basis for this assessment, covering the addressable market available to the operator, which party holds the customer relationship, the extent to which the satellite operator deploys ground-based network infrastructure, such as regional gateway earth stations, PoPs and core network functions, and the spectrum rights used to reach users. Since space segment requirements are carried by the satellite operator, with the exception of D2D using IMT spectrum, the other components are generally more informative for shaping how national obligations should apply. Requirements carried across directly from terrestrial frameworks may require information for calculating licence fees and sectoral contributions that cannot be practically provided under the relevant operating model. They may also impose costs that are out of proportion to the nature and scale of a satellite operator's activity in the country. Annex B summarises how the regulatory areas covered in this report may apply across the five operating models considered.

Where the existing framework does not fully achieve the relevant regulatory outcomes for a particular operating model, any additional measures should be designed around the capabilities and scale of the services being provided.

Measures that are not calibrated in this way risk deterring entry and may risk jurisdictions losing out on benefits that satellite connectivity brings, such as wider coverage in rural and remote areas, greater resilience when terrestrial networks fail, improved emergency reach and more efficient use of public funds intended to close terrestrial coverage gaps.

5.2 National authorities should test if proposed obligations are necessary, possible to comply with, proportionate, and well-balanced

Having developed a firm understanding of the relevant satellite network architecture and operating model, national authorities should assess proposed measures against four principles: necessity, possibility, proportionality and balance. Measures that fall short against any of these principles should be reconsidered before they are imposed.

- **Step 1 – Necessity: Clarify the outcome that the proposed measure is intended to secure, and whether it is already being met.** For state control-driven requirements, this involves identifying the baseline outcome that the state needs to secure (e.g., oversight of systems serving its territory, or lawful access to communications), and whether any gap remains once obligations held by other parties are taken into account. For market functioning-driven requirements, this involves identifying the user or market outcome being pursued (e.g. fair billing or access to emergency services), and which party is best placed to deliver it. Where a locally licensed partner is already subject to relevant obligations, or where the outcome can be achieved through an alternative technical route, a new requirement on the satellite operator may not be **necessary**.
- **Step 2 – Possibility: Test whether compliance is technically feasible under the relevant satellite network and operating models.** Requirements carried directly across from terrestrial frameworks may assume information, network functions or technical capabilities that are not available under a given model. For example, it may be impossible for a satellite operator to report subscriber, device or terminal numbers under wholesale or partnership models where it does not hold the end-user relationship, or know how many subscribers or devices use the capacity it supplies. Authorities could consider alternative approaches that secure the same outcome and can be reliably measured and verified under the relevant model.

- **Step 3 – Proportionality: Assess whether the burden of complying with the measure is proportionate to the scale and nature of the operator's activity in the jurisdiction.** This assessment is particularly relevant in regulatory areas such as corporate entity requirements and licence fees and sectoral contributions, where the burden imposed may not vary with the scale of an operator's activity. Such measures may, therefore, weigh more heavily on a satellite operator with limited activity in a particular jurisdiction, given the multi-market footprint of satellite connectivity. Measures may be justified for satellite operators that serve a large retail customer base, but could be prohibitive for operators serving a small number of users or sites. A measure would be

- **Step 4 – Balance: Weigh the benefits of the measure against the policy benefits that could be lost if it deters entry.** For example, emergency services provision requirements may be justified where a satellite operator serves end users directly at scale, but should be reviewed to ensure that they are fit for purpose for satellite technology and its constituent operating models. Measures may be duplicative where satellite extends the coverage of a terrestrial provider that is already subject to relevant obligations, particularly if they weaken the case for launching the service by raising the compliance burden to unsustainable levels. Licence fees and sectoral contributions raise a similar trade-off, particularly where universal service funds have already been collected but remain unused, or where fibre deployment in very remote areas has proven uneconomic or exceeded forecast costs. Allocating these funds to satellite may close terrestrial coverage gaps more efficiently. A measure would be **well-balanced** if it secures the targeted regulatory outcome without undermining other policy objectives, such as improving rural coverage, network resilience and emergency reach.

Applying this process is likely to produce different answers for different satellite operating models. Requirements should be fit for purpose, reflecting the capabilities and architecture of the relevant satellite technology rather than applying the same rules developed for terrestrial networks. A measure that is justified where a satellite operator sells directly to end users may also be unnecessary where a wholesale customer or mobile partner is already subject to relevant obligations. Authorities should therefore consider the satellite technology and operating models currently in use, as well as those that could realistically be adopted in future, before deciding on specific measures.

Similar considerations apply across jurisdictions. A requirement that appears reasonable when considered in one country may become difficult to sustain when replicated across the many countries served by the same satellite system. This cumulative burden may not be visible to individual authorities, but can affect whether operators can justify entering or continuing to serve as many countries as they otherwise could.

Frameworks that account for satellite technology and relevant operating models, and apply the four regulatory principles set out above, would allow satellite connectivity to complement terrestrial networks more effectively. This would support wider coverage, greater resilience and new routes for closing persistent connectivity gaps in countries at all levels of development, including large and advanced markets where substantial terrestrial coverage gaps remain.

Annex A Jurisdictional approaches to satellite regulation

This annex provides an overview of how selected jurisdictions are addressing key regulatory issues relevant to satellite connectivity across the regulatory topics introduced in Section 4. The examples are not intended to provide a comprehensive assessment of each jurisdiction's framework; rather, they illustrate the range of approaches being adopted globally and highlight areas where regulatory treatment is evolving. Together, they provide practical examples of how policy makers and regulators are implementing or adapting regulatory requirements.

There are three emerging themes from our preliminary views on recent developments in satellite regulation globally:

- **Regulatory fragmentation:** Satellite networks often operate across national borders or serve multiple jurisdictions, but operators are often required to comply with diverse national requirements relating to authorisations, reporting, gateways, local presence and fiscal obligations. Domestic regulatory differences increase compliance costs, complicate regional operations and may deter market entry. Additionally, some jurisdictions have conflicting requirements that create barriers for an entity trying to serve those overlapping jurisdictions. Given the cross-border nature of satellite networks, regional alignment and internationally recognised frameworks and best practices can often provide a more consistent and efficient basis for authorisation.

- **Applicability to different satellite operating models:** Many existing frameworks were developed before the emergence of new operating models and do not clearly distinguish between wholesale capacity provision, wholesale and partner-delivered services, D2D partnerships and direct provision to consumer and enterprise end users. As a result, obligations are often applied broadly or inconsistently, creating uncertainty as to which entities should be responsible for compliance.

- **Market access and regulatory evolution:** Regulators are increasingly considering the impact of regulation on market entry and investment, especially for nascent services such as those enabled by D2D. Consultations, sandboxes, temporary measures and technology-neutral approaches indicate a willingness to gather evidence and adapt frameworks as satellite broadband and D2D services evolve, often helping to limit unnecessary barriers or regulatory burdens.

The examples presented in Figure A.1 highlight several common themes and emerging trends across jurisdictions.

Figure A.1: State of play across various regulatory topics [Source: Analysys Mason, 2026]

Regulatory topics	Jurisdictional examples	Observations
Telecoms-related licensing *State control-driven* *Market-entry related*	**Simplified or flexible approaches to licensing can lower barriers to entry:** • US FCC required satellite deployment milestones when authorising Amazon Leo's D2D service, but granted flexibility when they were not met[i] • Colombia removed its domestic capacity-provider registry, allowing free space segment capacity for approved Andean Community satellites[ii] **Some measures may unintentionally add complexity:** • European regulators applied additional notification requirements on top of EU 2GHz authorisation, to authorise use of spectrum nationally; see for example the approach taken in Belgium[iii] • Brazil permits only secondary D2D use of IMT spectrum through partnerships with licensed MNOs, protecting primary terrestrial use[iv]	**Regulatory fragmentation:** Approaches range from streamlined notification or general-authorisation frameworks to dedicated landing-rights and market-access regimes. Recent reforms indicate a trend towards simplifying authorisation processes, although significant variation remains between jurisdictions **Network and service licensing approaches:** Jurisdictions take different approaches to distinguishing between operators that provide communications infrastructure and those that provide end-user services. Some frameworks separate network and service authorisations, while others regulate both activities under a common licensing regime. Regardless of suitability for the national context, the diversity of approaches across jurisdictions could complicate entry for satellite operators. **Emerging approaches to D2D:** Various regulators have issued proposals for 'use of terrestrial spectrum in space', which generally propose commercial agreements between satellite operators and nationwide MNOs as a means of combining requirements under a single licence. Regulatory approaches for independent D2D service provision by satellite companies remain less developed, reflecting their early stage of deployment and current limited-service offerings.
User terminal licensing *State control-driven*	**Blanket or class authorisations remove the need for individual terminal licensing:** • The US FCC allows blanket licensing of FSS earth stations in specific bands[v] • Mexico introduced blanket licensing for customer terminals in 2023, allowing ESIMs to operate under the same authorisation[vi]	**Movement towards blanket authorisation:** Regulators are moving towards network-level, class-licence or blanket-authorisation approaches for satellite terminals and D2D-enabled devices. Some regulators, however, require more stringent approval, registration and certification requirements.

Market-entry related	• The UK's Ofcom created a licence exemption for mobile handsets and SIM-enabled devices connecting to D2D services[vii] • Germany's BNetzA allows MSS terminals to operate under one frequency authorisation[viii] • New Zealand uses blanket licensing procedures to allow customer terminals to be operated within mandated technical parameters[ix] • Australia's CSO Class Licence allows MSS-capable handsets to operate without individual terminal licences[x] **Some terminal registration requirements present a trade-off risk to market entry:** • Belize requires owners and operators of Starlink terminals to register their use and Uganda requires Starlink to ensure local registration of all activated devices; comparable retail D2C operators may be subject to similar requirements[xi] [xii]	
Cyber security *State control-driven* *Service-provision related*	**Satellite operators are often captured by existing cross-sector cyber-security frameworks:** • US FCC licensing rules already require satellite operators to secure satellite facilities and command systems[xiii] • EU NIS2 requirements demonstrate that satellite operators are already subject to cyber security obligations[xiv]	**Existing security frameworks:** Many jurisdictions already apply cyber security and network-security obligations through existing cyber security frameworks, which extend to satellite operators.
Lawful access and localisation *State control-driven* *Service-provision related*	**Lawful-interception objectives can be met without requiring infrastructure localisation:** • Most countries do not require a domestic gateway • For example, in the UK, Ofcom's licensing guidance for NGSO earth stations does not require operators to establish a domestic gateway to obtain a network licence and provide services through user terminals; lawful-interception requirements are addressed separately through operator-level technical capability obligations[xv] • EU recognises and adopts ETSI standards as the technical framework for lawful interception[xvi]	**Lawful interception:** Regulators are recognising that lawful interception objectives can be achieved through regional gateways, cross-border co-operation arrangements and recognised technical standards, rather than requiring a physical gateway in every country served.

	• EU's mutual-assistance arrangements allow lawful interception through gateways located in another Member State[xvii] • Iraq permits initial, phased use of out-of-country gateways on a temporary basis and varies localisation requirements based on operating model differences[xviii] **Localisation requirements may risk creating additional infrastructure and operational burdens:** • Uganda requires Starlink to have a domestic gateway and in-country PoP for security and monitoring, and to ensure the local registration of active devices, to support regulatory enforcement in line with local laws[xix]	
Corporate entity requirements *Market functioning-driven* *Service-provision related*	**Some regimes establish local accountability without requiring extensive domestic operations:** • Brazil's ANATEL requires foreign satellite operators to appoint a legal representative incorporated and based in Brazil[xx] • Australia allows satellite operators, under its carrier licence, to enter the market without requiring incorporation of an Australian corporate entity, domestic network-control facilities, operational infrastructure[xxi] **More extensive local-presence requirements may risk deterring market entry for satellite operators:** • Canada requires NGSO operators with a Canadian filing to maintain primary control facilities and network operations centres in Canada[xxii] • Equatorial Guinea requires Starlink's commercial operations to be overseen by GITGE and is negotiating the creation of a local operating unit; comparable local-presence requirements could be imposed on future retail D2D or satellite broadband operators[xxiii] • Uganda's UCC requires Starlink to have an operational office with technical and legal support staff: similar requirements could apply to future retail D2D or satellite broadband operators[xxiv]	**Regulatory fragmentation:** Domestic requirements range from basic local-presence obligations to more extensive obligations involving domestic operational facilities. **Operating model differentiation:** Existing requirements rarely differentiate between satellite operating models, despite significant differences in customer relationships, domestic presence and operational responsibilities. **Evolving market-entry conditions:** Some authorities are indicating a growing focus on local accountability, regulatory oversight and transparency, particularly on new market entrants where operators provide services directly to end users.

Emergency services provision *Market functioning-driven* *Service-provision related*	**Regulatory approaches to satellite-enabled emergency services are varied and are evolving to allow flexibility in how connectivity is delivered:** • US FCC established interim 911 obligations for terrestrial providers using the SCS framework[xxv] • Ofcom decided not to add emergency service provision conditions to D2D authorisations while use of D2D services are still developing, as of September 2025[xxvi] • Namibia's NETP (National Emergency Telecommunication Plan) expects telecom operators to maintain emergency plans and include LEO, VSAT and satellite phones within disaster response preparedness[xxvii] • Australia's proposed UOMO (Universal Outdoor Mobile Obligation) uses a technology-neutral coverage obligation and expects, but does not explicitly state, that an MNO may need to use D2D satellite connectivity[xxviii] **Industry-led partnerships are already extending emergency connectivity via satellite:** • Following Amazon's acquisition of Globalstar in 2026, Amazon and Apple announced that Amazon Leo would power Emergency SOS services on iPhone and Apple Watches via satellite[xxix] • Orange Business strengthened emergency SafetyCase units in France with Eutelsat's satellite connectivity (industry-led example)[xxx]	**Outcome-focused, developing frameworks:** Regulators are increasingly recognising the role satellite connectivity can play in extending resilience and coverage. Early D2D frameworks are often technology-neutral or flexible approaches to providing coverage. **Industry-led delivery models:** Some satellite-enabled emergency communications are being developed through commercial partnerships rather than specific regulatory mandates. MNOs, device providers and satellite operators are increasingly using satellite connectivity to extend emergency communications beyond terrestrial coverage and improve resilience.
Service quality and consumer protection *Market functioning-driven* *Service-provision related*	**Service-quality requirements can be adapted to reflect the nature of the licensed partnership and/or characteristics of satellite networks:** • Retail facing consumer obligation conditions remained with VMO2 and VodafoneThree after Ofcom authorised their D2D partnerships with Starlink Mobile and AST SpaceMobile respectively[xxxi] • Nigeria has established different ISP KPIs with specific targets that relate to satellite orbit type (GEO/MEO/LEO) and differentiates satellite technology from terrestrial KPIs[xxxii]	**Retail service obligations:** Where satellite operators provide services directly to consumers, regulators may apply the same types of consumer-protection measures commonly found in telecoms frameworks, however this should ideally account for differences in satellite technology. Direct enterprise provision typically addresses specialised requirements through negotiated contracts and should not automatically attract the same consumer-protection measures.

		Commercial service arrangements: In some cases, quality-of-service commitments may be governed through commercial agreements between satellite operators, service providers and enterprise customers, reducing the need for regulators to prescribe detailed performance requirements
Licence fees and sectoral contributions *Market functioning-driven* *Market-entry related*	**Simple or one-off fee structures can reduce the cost and complexity of market entry:** • Nigeria introduced a streamlined process for obtaining landing rights authorisation, with a one-off fixed fee[xxxiii] • Ghana established a simple process for obtaining landing rights that are valid for 10 years; no annual fees[xxxiv] **Recurring and revenue-based charges can increase the ongoing cost of service provision, presenting trade-off risks deterring market entry:** • Mexico combines mandatory state reserve capacity obligations with recurring spectrum-use fees for all operators and upfront concession payments for national operators[xxxv] • Liberia imposes annual licence fees and annual regulatory fees, including a percentage of revenue[xxxvi] • Liberia also has a USF requirement of 0.5% of gross annual revenue as an additional cost for satellite D2D services[xxxvii] **Technology-neutral fiscal treatment can place satellite operators on a similar footing to other providers:** • In Uganda, as of 2026, Starlink faces similar taxes as other ISPs, irrespective of choice of technology deployed; comparable retail operators will likely be subject to the same tax obligations[xxxviii]	**Market-entry incentives and administrative simplicity:** Some regulators have adopted relatively simple fee structures, long-duration authorisations or one-off payments to encourage market entry and connectivity expansion. **High recurring fees and cumulative fiscal burdens:** Other regimes apply annual licence fees, regulatory fees, revenue-based contributions and universal-service obligations on top of market-access requirements. **Measurement and reporting challenges:** Satellite operators often serve multiple countries through regional networks and commercial arrangements, making country-specific traffic and customer activity potentially difficult to identify.

Annex B Regulatory considerations across operating models

This annex sets out how the regulatory areas discussed in Section 4 may apply across the five satellite operating models introduced in Section 3. The table below identifies where the allocation, design or burden of a measure may differ depending on the parties involved, the network functions they perform and the extent to which the satellite operator serves end users directly. It does not set out to prescribe a single regulatory approach for each model, but rather provide a practical reference for applying the principles developed in the report, highlighting where existing obligations may already secure the relevant outcome, where requirements may be difficult to apply in practice, and where measures should be calibrated to the operator's role and likely scale in the market. Responsibilities may vary within each model, including where infrastructure or service management is shared.

Figure B.1: Regulatory considerations across operating models [Source: Analysys Mason, 2026]

Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to targeted consumer and enterprise end user segments	Independently retailed D2D
Telecoms-related licensing				
Where operators already hold internationally co-ordinated filings and established authorisations in other countries, streamlined and predictable market-access processes are generally preferable. Specific requirements should be assessed against the incremental assurance and benefits they provide over and above an ITU-filings led approach.	Authorisation approaches should recognise that if the locally licensed ISP, telecoms provider or reseller holds the end-user relationship and associated retail service licence, they will already hold domestic service obligations. Specific requirements should be assessed against the incremental assurances they provide and the risk of deterring or delaying market entry. For jurisdictions that require landing rights, the satellite operator should generally require only authorisations relevant to the activities it performs, including any managed-service or shared-infrastructure functions, avoiding duplication of the local partner's service licence.	Authorisation approaches should recognise that if the partner is a national licensed mobile operator in the market, they will already hold spectrum rights and domestic service obligations, which new obligations may duplicate. Specific requirements should be assessed against the incremental assurances they provide and the risk of deterring or delaying beneficial coverage beyond terrestrial networks.	Where operators already hold internationally co-ordinated filings and established authorisations in other countries, streamlined and predictable market-access processes are generally preferable. Specific requirements should be assessed against the incremental assurance and benefits they provide over and above an ITU-filings led approach.	Because spectrum licences are finite, regulators are reconsidering MSS authorisation conditions at renewal, which is legitimate. Specified requirements should be assessed against the incremental assurance they provide and the risk of deterring beneficial entry. Market-access approvals and spectrum authorisations by regulators are appropriate. Conditions attached to these processes should be proportionate to the scale of the likely penetration of services

Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to targeted consumer and enterprise end user segments	Independently retailed D2D
User terminal licensing				
Network-level or blanket authorisation is appropriate to simplify the regulatory process. The incremental assurance from licensing terminals individually is likely very small, while the cost and risk of deterring entry are likely large, especially in smaller jurisdictions.	Network-level or blanket authorisation is appropriate to simplify the regulatory process, and would allow the local partner to deploy compliant customer terminals without individual licences or registrations. The incremental assurance from licensing terminals individually is likely very small, while the cost and risk of deterring entry are likely large, especially in smaller jurisdictions.	Exemption or blanket authorisation avoids duplication and does not deter coverage-enhancing partnerships. Individual registration or approval adds incremental assurance compared with the cost and risk of deterring entry, because the devices are already certified under terrestrial frameworks.	Blanket licensing is crucial for this model. The incremental assurance from licensing or registering each terminal is likely very small, while the cost and delay of deterring entry could be large, especially for smaller jurisdictions.	Blanket licensing can allow large numbers of low-power terminals to be deployed quickly. Individual registration or approval adds incremental assurance compared with the cost and risk of deterring entry, particularly in smaller markets. Operators already meet device type-approval requirements, and regulators could streamline the process with blanket authorisation.
Cyber security				
Satellite operators are already responsible for securing the space segment and associated ground infrastructure they operate.		Cyber security obligations should reflect responsibility for related network functions.	Retail satellite operators are responsible for securing the end-to-end service they provide.	
Existing cyber security obligations and industry standards generally achieve the underlying security objective. Additional measures should be assessed against the incremental assurance they provide and the risk of deterring beneficial market entry.		Where satellite connectivity is integrated with a terrestrial mobile service, existing obligations on the terrestrial network operator may already address many customer-facing security outcomes, while the satellite operator remains responsible	Cyber security requirements may therefore be more-directly applicable than in wholesale models, but should remain outcome-focused and reflect satellite architecture.	As these services evolve, cyber security requirements may become increasingly relevant, particularly where operators provide customer-facing communications services at scale. Measures should remain proportionate to the maturity, scale and

Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to targeted consumer and enterprise end user segments	Independently retailed D2D
		for securing its own infrastructure.		technical architecture of the service.
Lawful access and localisation				
Many jurisdictions currently support lawful intercept through the use of regional or virtual gateways and PoPs. The satellite operator remains responsible for securing its own infrastructure and supporting lawful access where relevant. Regulators considering more onerous obligations (e.g. requirements to deploy domestic physical infrastructure) on top of these internationally accepted norms should consider whether the incremental assurance likely to be gained by more onerous requirements would be worth the trade-off of potentially deterring beneficial entry.				
Corporate entity requirements				
Local presence requirements do not generally apply to wholesale-only satellite operators that provide services through locally established and licensed partners.		Basic notification requirements that allow authorities to identify and engage with satellite operators are generally consistent with established international practice. More onerous requirements should be assessed against incremental assurance provided and the risk of deterring beneficial market entry.		
Although countries have the right to impose them, local establishment rules are less relevant for wholesale capacity provision.	Where the locally established ISP, telecoms provider or reseller holds the relevant customer-facing responsibilities, it may already provide an accountable domestic presence.	The locally established MNO already provides accountable domestic presence for end-user obligations.	Measures should remain proportionate to the maturity, scale and technical architecture of the service.	
Licence fees and sectoral contributions				
Measuring scale of activity precisely in one country may not be feasible. Cost-based fees thus probably best balance proportionality, feasibility and market-access incentives, especially where the commercial opportunity is limited. Overly onerous fixed fees risk deterring beneficial entry.		Cost recovery makes sense in most cases, and overly onerous fees risk deterring beneficial entry. Fixed fees, if high, can be less conducive to entry than scale-based ones. On USF, where collected funds are stuck or poorly used, satellite operators could be allowed to use them to close terrestrial coverage gaps.		
Fiscal obligations should distinguish between different activities across the value chain and avoid unnecessary duplicative taxation of wholesale and retail services, which could ultimately increase costs for end users.		Fiscal obligations should distinguish between different activities across the value chain and avoid unnecessary duplicative taxation of	If a D2C operator reaches scale comparable to scale that can be achieved through terrestrial operation, it would be fair to shift emphasis from entry incentives towards proportionate	

Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to targeted consumer and enterprise end user segments	Independently retailed D2D
USF obligations are less relevant for non-retail models.		wholesale and retail services, which could ultimately increase costs for end users.	outcomes and fair competition. That could include USF-type measures, adapted for technical differences.	
Service quality and consumer protection				
Capacity-only providers that sell through domestic partners may not be able to measure QoS in a given country. Consumer-facing QoS obligations on them would therefore be neither proportionate nor practical		Within terrestrial networks, mobile and fixed are already regulated differently on QoS because of capacity, choice and how services are marketed. This sets a precedent for tailoring QoS requirements based on technological differences		
Consumer outcomes may already be secured through obligations on the service partners who retail to end users, and in some cases through commercial agreements with enterprise customers.		Consumer outcomes are already regulated through the MNO partner's obligations. Regulators should focus on outcomes and on preventing misleading price packaging rather than moving terrestrial QoS obligations onto the satellite operator.	Architecture, capacity and how the service is offered must be taken into account. Regulators should focus on outcomes and preventing misleading pricing. Transferring fragmented, nationally specific QoS obligations to D2C operators would make it hard to standardise quality management across countries and would raise the cost of entry. Enterprise and government services typically address specialised requirements through negotiated contracts, which may already provide appropriate performance commitments and remedies. They should not automatically be subject to the same protections as consumer retail services. QoS requirements could be justified for D2C operators setting their own price plans against terrestrial operators. Regulators should weigh parity against coverage and choice, given that satellite network capacity limits how many customers can be served. Even at scale, measures should reflect satellite architecture rather than being transposed from mobile/fixed.	

Wholesale backhaul and capacity	Wholesale and partner-delivered services	Integrated partnership D2D	Direct provision to targeted consumer and enterprise end user segments	Independently retailed D2D
Emergency services and public safety				
Onerous measures could be unworkable or counterproductive by deterring market entry. A holistic view should prioritise outcome-based obligations for emergency services and recognise satellite's positive role in public safety and resilience. Where the wholesale buying parties already carry obligations, new measures for the satellite operator may be duplicative and add limited value.			Measures related to emergency services and public safety should be outcome-focused and reflect the satellite connectivity's role in maintaining connectivity during terrestrial network outages, as well as its architecture and scale of market activity. Requirements should also distinguish consumer emergency calling from specialised maritime, aviation and government safety communications, recognising the public-interest role of those services. Operators providing retail services to large numbers of users are the exception where specific measures may be warranted.	Obligations should reflect the technology's scale, capability and be adapted to satellite architecture and scale of market activity. If independent retail operators scale to compete directly with terrestrial networks at national level (coverage etc.), new emergency-services regulation to give customers comparable outcomes would be justified. Before that scale is reached, onerous measures could be counterproductive to market entry.

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