

ARTICLE 02

The New Five-Layer Telecom Ecosystem

A new map of power, control and value



The New Five-Layer Telecom Ecosystem

An operating map of power, dependency and value in total connectivity

AUTHOR Moderion Advisory

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EXECUTIVE PROPOSITION

The programmable telecom economy cannot be understood through the old operator-vendor-value-chain model. It is better read as five porous operating layers connected by three cross-cutting forces: trust, capital and sovereign authority.

Executive summary

The programmable telecom economy cannot be understood through the old operator-vendor-value-chain model. It is better read as five porous operating layers connected by three cross-cutting forces: trust, capital and sovereign authority.

This evidence-led thought article develops an executive point of view using standards, official data, company disclosures and Moderion Advisory analysis. It separates established facts from emerging direction and reported implementation.

EXECUTIVE QUESTION

Which actors now control the assets, interfaces and obligations that determine value in programmable telecommunications?

Key insights at a glance

- The traditional operator-vendor-customer chain no longer describes control of compute, models, devices, satellite reach, API distribution or developer demand. A layered control map is more decision-useful than a linear supply chain.
- Moderion's model contains five operating layers, but Layer 5 is intentionally resolved into two sub-tiers: 5a for network API exposure and CPaaS orchestration, and 5b for generative AI, intelligence and user-intent aggregation. They share software economics while controlling different interfaces.
- The model is an original strategic synthesis, not an industry standard. It is consistent with the direction of ITU IMT-2030, 3GPP evolution, GSMA Open Gateway, AI-RAN and NTN work, but should not be attributed to any one standards body.
- Multi-layer positioning is normal. Huawei spans network systems, devices, silicon, cloud and AI; SpaceX spans launch, constellation, terminals and distribution; major operators increasingly span access, cloud, fintech, content and enterprise solutions.
- Bargaining power accumulates at hard-to-substitute interfaces: device operating systems, accelerated-compute software, orchestration, subscriber identity, API distribution, model platforms, user-intent aggregation and direct satellite distribution.
- Trust, capital and sovereign authority operate across every layer. A technically elegant architecture can still fail if liability, investment duration or jurisdictional control is unresolved.

- This article contributes to the Total Connectivity Economy by testing its enabling mechanism against universal reach, open interoperability, governed intelligence, trusted participation and sustainable economics.
- Peer-reviewed and scholarly literature supports a converging, multi-platform 6G ecosystem and alternative layered constructs such as connection, content, context, computing and commerce. It does not validate Moderion's exact five-layer taxonomy; that taxonomy remains an original control-rights synthesis.

Exhibit 1 | Five operating layers and their scarce control points

Layer	Representative actors	Scarce control points
1. Integrated operators	Vodafone, AT&T, e&, China Mobile, stc, Telefónica, T-Mobile	Spectrum, subscriber authority, local assurance, enterprise channels
2. Systems & orchestration	Ericsson, Nokia, Huawei, cloud and OSS/BSS providers	Network control, automation, interoperability, operational data
3. Silicon & compute	NVIDIA, Qualcomm, Intel, AMD, Huawei	Accelerators, radio platforms, software ecosystems, energy efficiency
4. Space & NTN	Starlink, Eutelsat OneWeb, Viasat, Kuiper, AST SpaceMobile, Space42	Orbit, spectrum, gateways, terminals, direct distribution
5. AI & programmable services	OpenAI, Google, Anthropic, DeepSeek, CPaaS and API aggregators	Models, developer access, applications, demand aggregation

Note: Actors may occupy multiple layers. Classification indicates the control point being analysed, not corporate identity.

Exhibit 2 | Three overlays across the five operating layers

Overlay	L1 Operators	L2 Systems	L3 Compute	L4 Space / NTN	L5a / 5b Software
Trust	SIM identity; consent	Policy; assurance	Workload isolation	Lawful access; continuity	API authorization; model provenance
Capital	Spectrum; fibre duration	Automation economics	Utilization; obsolescence	Launch; terminal; capacity	Unit economics; distribution scale
Sovereign authority	Licence; emergency duty	Control-plane access	Chip/export exposure	Landing; orbit; spectrum	Data, API and model jurisdiction

Note: The overlays apply to every layer but manifest through different control and failure mechanisms. Layer 5a is API/CPaaS orchestration; Layer 5b is AI and user-intent aggregation.

Exhibit 4 | Five layers, five governing tests

Governing test	Question across every layer	Failure if ignored
Universal reach	Who remains unserved or economically excluded?	Nominal coverage without participation
Open interoperability	Can capabilities and workloads move across conformant interfaces?	Walled gardens and cumulative lock-in
Governed intelligence	Who authorizes, observes, contests and reverses machine decisions?	Opaque or unsafe autonomy
Trusted participation	How are identity, consent, jurisdiction and recovery controlled?	Systemic security and legitimacy failure
Sustainable economics	Does lifecycle value exceed financial, energy and societal cost?	Expansion that cannot endure

Note: Moderion Advisory governing-principle test. The principles are outcome constraints, not additional operating layers.

Core analysis

Why the old map fails

The classical industry map placed operators at the centre, equipment vendors upstream and customers downstream. That view remains useful for physical network supply, but it no longer explains who controls

identity, compute, models, APIs, orbital capacity, developer access or enterprise outcomes. Companies now occupy several positions at once. An operator may own cloud infrastructure, aggregate digital services and expose APIs. A satellite company may control spacecraft, spectrum, terminals and direct customer distribution. A semiconductor firm may shape both hardware economics and the software environment used to optimize the network.

A better model must therefore explain control rather than force every company into one box. It should show which actor owns the scarce asset, who defines the interface, who can observe performance, who holds the customer contract, who bears failure risk and who can replace whom.

The five operating layers

Layer one comprises integrated operators and digital-service aggregators: national and multinational groups that combine access networks, customer relationships, enterprise channels and service portfolios. Layer two comprises network systems and orchestration providers: radio, core, optical, automation and assurance capabilities that make heterogeneous infrastructure operate. Layer three comprises silicon and accelerated compute: processors, accelerators, radio platforms and the software stacks that increasingly determine performance and portability.

Layer four comprises satellite and non-terrestrial connectivity platforms, including constellations, gateways, spectrum positions, terminals and wholesale arrangements. Layer five comprises frontier AI, model and programmable-service platforms: foundation models, CPaaS, developer ecosystems, network API aggregators and applications that convert underlying capabilities into experiences and business processes. The model is intentionally porous. A company can occupy several layers, but its power should be assessed separately at each control point.

The overlays that determine legitimacy

Trust cuts across every layer. It includes identity, cybersecurity, safety, explainability, consent, resilience and the ability to audit decisions. Capital is the second overlay because each layer has a different duration, risk and return profile. Spectrum and fibre cannot be financed as if they were software; experimental AI capacity should not be valued as contracted infrastructure. Sovereign authority is the third overlay because communications systems operate inside jurisdictions, security obligations and public-interest mandates.

These overlays prevent a purely technical architecture from becoming a strategy. A technically interoperable ecosystem can still fail if responsibilities are unclear, capital is mispriced or jurisdictional control is unacceptable. Conversely, excessive localization can destroy scale, interoperability and innovation. The strategic task is to decide which capabilities must be controlled, which can be diversified and which should remain globally standardized.

Where bargaining power accumulates

Bargaining power tends to accumulate around interfaces that aggregate demand or make substitution difficult. These include device operating systems, model platforms, semiconductor software environments, orchestration systems, API channels and direct-to-customer satellite distribution. Operators possess their own defensible interfaces - numbering, authentication, licensed spectrum, regulated access, local service assurance and enterprise relationships - but must make them consumable without surrendering governance.

The five-layer model should not become a prediction that one layer will dominate. Its purpose is to expose dependencies and strategic options. An operator can deepen integration, build a consortium, buy capability, establish multi-vendor portability or accept dependency under a clearly priced contract. What matters is that the choice is explicit.

Moderion Advisory perspective

A control-point method for ecosystem analysis

Each strategic relationship should be decomposed into six questions: who owns the scarce asset; who defines the interface; who observes performance; who contracts the end customer; who carries failure and regulatory liability; and how quickly the dependency can be substituted. This exposes the difference between participation and control.

A company can be strong in one layer and dependent in another. The assessment should therefore be made by product and geography, not by assigning a permanent label to the enterprise. This matters for joint ventures and strategic partnerships, where board rights may look balanced while data, distribution or technical roadmaps remain concentrated.

The ecosystem scenarios executives should test

Three scenarios deserve explicit testing. In operator-led orchestration, carriers retain subscriber authority and enterprise distribution while using multiple technology partners. In platform-led aggregation, global developer or AI platforms simplify demand and purchase underlying connectivity wholesale. In sovereign federation, national or regional ecosystems preserve local operational authority while interconnecting through common standards.

The likely future is a mixture by service and jurisdiction. Strategy should not select one universal winner; it should define the control position the organization requires under each scenario and the contractual or architectural safeguards needed when it does not own that position.

Operationalizing trust and spectrum authority

Trust must become a technical transaction, not a brand adjective. NIST zero-trust architecture removes implicit trust based on network location or asset ownership and requires discrete authentication and authorization for the subject and device. At the operator interface, SIM-based subscriber authority and CAMARA/Open Gateway capabilities such as Number Verification and SIM Swap can provide real-time evidence that an OTT platform cannot create independently. The moat is strongest when the operator combines authoritative data with consent, purpose limitation, continuous verification and contractual accountability.

Spectrum control is also becoming relational. Licensed terrestrial spectrum remains a sovereignly assigned Layer 1 asset, while private and shared regimes distribute access differently by jurisdiction. In the United States, the FCC's Supplemental Coverage from Space framework permits eligible terrestrial licensees to lease spectrum rights to satellite partners under defined entry and interference rules. The result is not the disappearance of sovereign spectrum authority; it is a Layer 1-Layer 4 control arrangement in which the terrestrial license, satellite infrastructure and regulatory accountability must be analysed together.

The five layers are an operating map, not a closed hierarchy

The Total Connectivity Economy depends on coordinated actors across integrated operators, network systems, compute and silicon, space and non-terrestrial platforms, and software distribution and intelligence. The model makes control points and dependencies visible; it does not imply that five corporate categories can explain every ecosystem role. Trust, capital, sustainability and sovereign authority operate across all layers.

External validity of the five-layer model

The closest academic comparators describe vertically controlled connectivity platforms, horizontal content and cloud platforms, and oblique multi-sided ecosystems, while the 5C literature follows connection, content, context, computing and commerce. Moderion's model uses a different unit of analysis: scarce control points over assets, orchestration, compute, spatial reach and demand aggregation.

The model should therefore be judged by decision utility rather than taxonomic conformity. It is useful if it reveals concentration, substitutability, liability and value-capture risk more clearly than a linear value chain; it should be revised when a material control point cannot be located or when two layers do not produce distinct strategic choices.

Exhibit 2 | Dependency decision matrix

Dependency	Consequence	Substitutability	Preferred response
Low	Limited service impact	High	Standard procurement
Material	Customer or cost impact	Moderate	Portability and secondary source
Critical	National / systemic impact	Low	Control, escrow, dual operation or sovereign capability

Note: Moderion Advisory strategic dependency framework.

Executive action agenda

- Map every strategic partner and supplier to each layer and, within Layer 5, distinguish API/CPaaS control (5a) from AI and user-intent control (5b).
- For every critical interface, record the owner, switching cost, data rights, failure accountability and jurisdiction.
- Overlay capital duration and return expectations on the technical architecture.
- Define sovereign-control requirements by capability, not by nationality alone.
- Use the model to test alternative ecosystem scenarios before committing to platform-scale investments.

Conclusion

The five-layer ecosystem is a decision model, not an industry standard. Its value lies in making power visible. As telecom becomes programmable, compute-intensive and spatial, strategy will depend less on the number of assets a company owns and more on the interfaces it controls, the responsibilities it accepts and the trust it can sustain across organizational and national boundaries. In the wider series, this capability is treated as an enabler of the Total Connectivity Economy rather than as an end state in itself.

Selected evidence and references

- T001 | ITU-R. Framework and overall objectives of the future development of IMT for 2030 and beyond. 2023. ITU Recommendation M.2160-0. <https://www.itu.int/rec/R-REC-M.2160-0-202311-1>
- T002 | ITU-T. ITU-T IMT-2030 work programme. 2026. ITU-T Work Programme. https://www.itu.int/ITU-T/workprog/wp_block.aspx?isn=10791
- T008 | GSMA. From ambition to execution: how Open Gateway is scaling the global API economy. 2026. GSMA Newsroom. <https://www.gsma.com/newsroom/article/from-ambition-to-execution-how-open-gateway-is-scaling-the-global-api-economy/>
- T011 | TM Forum. ODA for Satellite project. 2026. TM Forum. <https://www.tmforum.org/news-insight/newsroom/tm-forum-launches-oda-for-satellite-project>
- T014 | AI-RAN Alliance. AI-RAN Alliance mission and working areas. 2026. AI-RAN Alliance. <https://ai-ran.org/>
- T015 | 3GPP. 3GPP Release 17 NTN work item. 2022. 3GPP Portal. <https://portal.3gpp.org/DesktopModules/CRs/CrDetails.aspx?CrId=443196>
- T016 | European Commission. Digital Networks Act proposal. 2026. Shaping Europe's Digital Future. <https://digital-strategy.ec.europa.eu/en/policies/digital-networks-act>
- T018 | IFC. Telecoms, Media and Technology sector framework. 2025. IFC. <https://www.ifc.org/en/what-we-do/sector-expertise/infrastructure/telecoms-media-and-technology>

- T050 | Luo, Jiang & Ren. A comparative and integrative mapping of thematic trajectories, the digital turn, and future research frontiers in telecommunications policy. 2026. Telecommunications Policy. <https://www.sciencedirect.com/science/article/pii/S0308596126001357>
- P001 | IEEE. A Comprehensive Survey of Large AI Models for Future Communications: Foundations, Applications, and Challenges. 2026. 10.1109/COMST.2026.3660844. <https://ieeexplore.ieee.org/document/11370829/>
- ITU-R. Recommendation M.2160-0: IMT-2030 Framework. <https://www.itu.int/rec/R-REC-M.2160-0-202311-I>
- GSMA. Open Gateway documentation. <https://open-gateway.gsma.com/docs>
- GSMA. Non-Terrestrial Networks: Opportunities and Challenges. https://www.gsma.com/solutions-and-impact/technologies/networks/gsma_resources/non-terrestrial-networks-opportunities-and-challenges/
- AI-RAN Alliance. AI-native RAN: from white papers to validation. <https://ai-ran.org/blog/ai-native-ran-from-white-papers-to-validation>
- NIST. Zero Trust Architecture, SP 800-207. <https://www.nist.gov/publications/zero-trust-architecture>
- NIST. Implementing a Zero Trust Architecture, SP 1800-35. <https://csrc.nist.gov/pubs/sp/1800/35/final>
- FCC. Single Network Future: Supplemental Coverage from Space, FCC 24-28. https://docs.fcc.gov/public/attachments/FCC-24-28A1_Rcd.pdf
- GSMA. Spectrum Policy Trends 2025: Supplemental Coverage from Space. <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2025/02/Spectrum-Policy-Trends-2025.pdf>
- Internet Society. Policy Brief: Open Internet Standards (2025). <https://www.internetsociety.org/resources/policybriefs/2025/policy-brief-open-internet-standards/>
- Internet Society. Critical Properties of the Internet. <https://www.internetsociety.org/resources/doc/2020/internet-impact-assessment-toolkit/critical-properties-of-the-internet/>
- PR004 | Ahokangas, P. et al. Business Models in 5G/6G Mobile Communications. In The Changing World of Mobile Communications, 137-165 (Springer, 2023). https://doi.org/10.1007/978-3-031-33191-6_6
- PR005 | Yrjola, S., Matinmikko-Blue, M. & Chowdhury, T. Sustainable business model designs toward 6G era. EURASIP Journal on Wireless Communications and Networking 2026, 55 (2026). <https://doi.org/10.1186/s13638-026-02600-1>
- PR006 | Xiang, P. et al. How does technological value drive 6G development? Explanation from a systematic framework. Telecommunications Policy 48(7), 102790 (2024). <https://doi.org/10.1016/j.telpol.2024.102790>