



COMPLEXITY COSTS

From tech complexity
to **strategic advantage**

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Why CIOs must act now to re-architect the digital foundation for an AI-driven enterprise

Executive summary

Enterprise technology has reached a point of inflection.

Over the past decade, organisations have modernised rapidly, moving to the cloud, expanding globally and adopting best-of-breed platforms. More recently, they have accelerated investment in artificial intelligence. Each step was taken with clear strategic intent.

Viewed in isolation, these decisions have delivered clear value. Taken together, they have created highly distributed digital environments that were never designed to operate as a single system.

The pressure is intensifying as AI scales. Gartner highlights that modern digital environments are generating rapidly expanding volumes of telemetry data, making it increasingly difficult for organisations to extract meaningful insight or act in real-time. *Gartner*

The result is a growing and often invisible complexity tax - one that quietly erodes cost efficiency, increases operational risk and slows the organisation's ability to adapt.

Complexity, when unmanaged, is no longer an IT concern; it is a material business risk.

This paper examines four critical questions for CIOs:



Where technology complexity is created - and why it is becoming systemic.



The hidden cost of complexity, and how it impacts performance, risk and investment.



How AI is amplifying these challenges across enterprise infrastructure.



What structural shifts are required to restore control, clarity and resilience.

Each of these questions reflects a single underlying reality: complexity is not the result of poor decisions, but the unintended consequence of many good ones made in isolation.

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65% of enterprises are still running on infrastructure that wasn't built for enterprise AI.

Bloomberg

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This shift is now creating measurable consequences. *McKinsey* suggests

up to 30% of IT spend can be optimised and reinvested in productivity, as a significant portion of low-value work can be automated.

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Where technology complexity really lives in the enterprise

If the executive summary defines the scale of the problem, its origin lies in how enterprise systems have evolved.

Technology complexity in large organisations rarely appears as a single failure or visible breakdown. Instead, it accumulates over time through layered decisions made across teams, regions and technology domains – gradually becoming a structural constraint on progress.

Crucially, complexity does not sit within individual platforms. It exists between systems.

It emerges in the handoffs between network and cloud teams, in the seams between legacy infrastructure and public clouds, and in the growing disconnect between how environments are designed and how they are actually operated. As a result, many CIOs struggle to pinpoint where it resides, even as its impact becomes increasingly felt.

Individually, systems may appear functional. Collectively, the estate becomes harder to predict, explain and control.



Technology complexity is no longer a function of individual technologies - it is a consequence of how those systems interact.

Why technology complexity is now a C-suite issue

As complexity increasingly spans across systems, its impact extends beyond IT operations into the core of the business.

For today's CIO, the scope of responsibility has radically expanded. Enterprises no longer operate discrete networks or isolated IT platforms. They operate digital backbones that directly underpin revenue generation, customer experience, regulatory compliance and business resilience. These backbones span continents and cloud environments. They carry sensitive and regulated data. They support real-time digital services with little tolerance for disruption.

In highly complex environments, CIOs are increasingly asked to explain cost overruns, outages and transformation delays, but fragmented systems make root causes difficult to articulate.

While AI is now a strategic priority, only **35%** of enterprises have the infrastructure required to scale it effectively.

Bloomberg

The business impact of failure is immediate and measurable. Industry benchmarks show that **over 90% of enterprises experience downtime costs exceeding \$300,000 per hour**, with many large organisations exceeding **\$500,000—\$1 million** per hour depending on sector and impact. *The Network Installer*

At the same time, transformation itself is slowing. As McKinsey notes, modern technology estates often suffer from accumulated architectural complexity, where new capabilities are layered onto legacy foundations rather than replacing them - creating drag on change initiatives and reducing overall ROI. *McKinsey*

There is a point where complexity stops being an inefficiency and becomes a business continuity risk.

It diverts capital from growth and innovation

Fragmented networks, cloud platforms and tooling consume disproportionate run-rate spend. An estimated 10–30% of IT budgets are lost to duplication, integration overhead and manual operations – money that should fund AI, digital experience and new revenue initiatives.

It slows transformation at the moment, speed matters most

Complex foundations introduce hidden dependencies that delay cloud, data and AI programmes. Infrastructure complexity routinely slows transformation by 20–50%, not due to lack of ambition, but because environments cannot absorb change safely or quickly.

Many organisations have crossed that threshold without realising it

A. Network complexity at global scale

If complexity has become a leadership issue, it is most visibly expressed in the network.

Enterprise networks have evolved into globally distributed digital backbones, supporting operations, applications and data across regions in real-time. Large organisations now connect hundreds or thousands of sites: offices, factories, hospitals, warehouses and partners, often across dozens of countries.

This scale brings structural consequences. Growth introduces multiple WAN technologies, layered security controls and a proliferation of service providers. While each decision may be justified locally, the cumulative effect is an environment where change slows, visibility fragments and resilience becomes increasingly fragile.

In many enterprises, deploying a new site or upgrading capacity still requires weeks of manual coordination.

When incidents occur, root cause often spans access networks, underlay, overlay, security and cloud ingress. With no end-to-end view, Mean Time to Resolution rises, not because teams lack skill, but because the operational picture is incomplete.

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Only **29%** of enterprises report that their infrastructure can scale with evolving business demands, highlighting how complexity can constrain growth, agility and transformation initiatives.

Redesign Group

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At scale, complexity transforms resilience from a strength into a point of exposure.

B. Multi cloud infrastructure: Choice without coordination

If the network reflects the scale of modern infrastructure, multi cloud reflects its complexity.

Multi cloud is now the default operating model for large enterprises. Most run workloads across multiple public clouds alongside private cloud or legacy data centres, gaining flexibility, but adding structural complexity.

Each cloud platform introduces its own networking constructs, policy models and tooling. Connecting environments remains largely manual. Establishing connectivity between two virtual networks can require **30+** configuration steps, each adding delay, risk and dependency on specialist expertise.

As environments scale, divergence becomes inevitable. Policies drift, IP schemes overlap and traffic paths become opaque.

Without consistent cross-cloud visibility, teams struggle to understand how performance, cost and risk interact end-to-end.

Gartner cites that most clients spend 10% to 15% of their cloud bills on egress costs and this percentage increases, the more complex the environment.

At the same time, Flexera research confirms that a significant proportion of cloud spend is wasted due to lack of governance and visibility, particularly in multi cloud estates. *Security Affairs*

Without coordination, cloud flexibility quickly turns into structural inefficiency.

C. The visibility and control gap

If network defines scale and multi cloud defines complexity, visibility defines control. The most dangerous aspect of enterprise complexity is that much of it remains unseen.

Large organisations often operate dozens of monitoring, management and security tools, each aligned to a specific domain. Gartner research indicates that the proliferation of specialised tools and telemetry sources is a primary driver of operational complexity, increasing cost, noise and response time. *Gartner*

At the same time, telemetry volumes continue to expand. Nearly every component of modern infrastructure now generates data, making it increasingly difficult to distinguish meaningful signals from background noise. *Sumo Logic*

The result is predictable: issues are detected later, resolution takes longer, and accountability becomes harder to define. The issue is no longer a lack of data, but a lack of coherent understanding.

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28% of leaders cite integration with legacy systems as a primary barrier to AI value. *Bloomberg*

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Complexity becomes dangerous, not when it exists, but when it cannot be seen or explained.



How complexity becomes operational friction

When complexity cannot be clearly seen, coordinated or controlled, it does not remain abstract - it manifests as persistent operational friction.

For CIOs, this friction becomes evident in everyday execution:

Cloud migrations stall due to inconsistent network and security policies

Security incidents span cloud, WAN and endpoint environments with no unified view



Acquisitions introduce duplicated platforms that are never fully rationalised

Scarce engineering talent is consumed by maintenance rather than innovation

The cumulative impact is significant. *McKinsey* suggests up to **30% of IT spend** can be optimised and reinvested in productivity improvements, as a significant portion of work across roles can be automated. At the same time, industry data suggests the average enterprise experiences between 14–18 hours of downtime per year, with downtime sometimes costing hundreds of thousands per hour. DataStackHub

Unmanaged complexity quietly erodes cost efficiency, slows transformation and drains talent, long before it triggers a visible failure.

The compound effect of AI

If complexity manifests as operational friction, AI accelerates it.

The next phase of complexity is not incremental - it is exponential. AI does not introduce complexity on its own. It amplifies existing weaknesses in technology foundations, faster, at greater scale, and with higher business impact than traditional workloads.

As AI adoption scales, the nature of operational complexity changes. Gartner notes that AI systems require new approaches to observability, as traditional monitoring cannot fully explain or govern AI-driven decision making. This creates a growing visibility gap, where organisations struggle to understand system behaviour despite increasing volumes of data.

As AI moves from experimentation to embedded business capability, four areas of structural fragility consistently emerge.

Data movement becomes the constraint

AI requires continuous, high-volume data flows across clouds and regions. Networks designed for traditional application traffic struggle to support sustained east-west AI data movement. Latency directly impacts model performance, while limited visibility into traffic paths drives unexpected cloud egress costs. In many organisations, connectivity - not compute - becomes the limiting factor for AI outcomes.



Multi cloud complexity shifts from choice to risk

AI accelerates multi cloud reality, with data and models spanning providers due to regulation, performance and ecosystem requirements. Cloud-specific networking and security models do not scale across platforms, turning manual inter-cloud connectivity into a source of delay, cost and operational risk. Architectural flexibility quickly becomes an execution bottleneck.

Tolerance for latency and downtime collapses

As AI becomes embedded in customer experience, operations and decision making, even minor latency spikes or short outages have immediate business impact. Legacy resilience and incident response models, measured in minutes and driven by manual coordination, are no longer sufficient.



Human-led operations fail at AI scale

AI generates vast volumes of operational data on top of already complex infrastructure signals. Human-only monitoring and troubleshooting cannot keep pace with the speed, volume and interdependence introduced by AI. Tool sprawl increases noise rather than insight, making automation and orchestration essential, not optional.

AI acts as a force multiplier. It exposes complexity that was previously tolerable and turns it into cost, risk and fragility. Enterprises that lack end-to-end visibility, coordinated control and automated operations find that AI amplifies problems before it delivers value.

The complexity tax: An invisible drain on the business

If AI exposes and accelerates complexity, its impact becomes measurable - and unavoidable. The consequences of unmanaged complexity accumulate quietly, appearing across cost, risk and speed.

From a risk perspective, longer Mean Time to Resolution increases exposure to outages, security incidents and compliance failures.

More concerning is that much of this impact remains unquantified. Leaders recognise the symptoms, but lack a clear view of the underlying drivers.



Bloomberg cites that only **29%** say their infrastructure can scale with evolving business demands.



Financially, duplication and fragmentation consume

10—30% of IT budgets.

Operationally,

20—40% of IT effort is diverted to keeping systems running rather than creating value.

The complexity tax is already embedded in the operating model - even when it does not appear explicitly on the balance sheet.

Why inaction carries increasing risk

If the complexity tax defines the cost of today's environment, inaction defines the risk of tomorrow.

Historically, enterprises could tolerate this level of complexity. Change was slower, growth was linear and infrastructure could lag ambition. That tolerance no longer exists.

AI-driven services, real-time digital experiences and globally distributed operations place unprecedented demands on performance and resilience. In this context, complexity is no longer just inefficient, it limits the organisation's ability to adapt.

Leading industry analysts: *Gartner*, *McKinsey*, and *IBM* consistently identify complexity, fragmentation and lack of integration as primary barriers to scaling digital and AI transformation at enterprise level. *IBM*

What was once operational friction is now strategic exposure. Without action, the next wave of transformation will amplify existing fragility rather than resolve it.

The shifts CIOs must make to regain control

If inaction increases risk, regaining control requires a fundamental shift in how enterprise infrastructure is designed and operated. As enterprise environments scale, the challenge moves beyond managing components to managing how those components behave together.

Across industries, leading organisations are recognising a set of structural shifts required to regain control of cost, performance and risk. These are not technology preferences; they are responses to how modern infrastructure now operates in practice.

A. From fragmented infrastructure to intelligent interconnection

Enterprise infrastructure has historically been built in layers: network, cloud, security and edge, each managed independently. In today's environment, those boundaries no longer hold.

Performance, cost and risk are now tightly interdependent. A routing decision in the network can impact cloud cost. A cloud architectural choice can affect security posture. A security control can influence application performance and user experience.

Infrastructure is no longer experienced in silos. It operates as a single system, whether it is designed that way or not. CIOs must therefore move from managing domains in isolation to operating infrastructure as a coordinated, end-to-end system.

B. Visibility as the foundation of operational trust

As environments have scaled, visibility has fragmented. Most enterprises are rich in telemetry but poor in actionable insight, with monitoring distributed across multiple tools and domains.

This creates a fundamental challenge at the leadership level. CIOs are expected to explain why incidents occur, what they cost and how they can be prevented, yet underlying data remains disconnected and difficult to interpret.

Complexity becomes dangerous, not when it exists, but when it cannot be seen or explained. Closing this gap requires a shift from fragmented monitoring to unified, end-to-end observability that correlates technical events into business-relevant insight.

C. The rise of the coordinated enterprise

Traditional operating models assume that teams monitor alerts, diagnose issues and coordinate responses manually. This approach does not scale in modern environments.

Even before AI, enterprises were losing a large portion of IT capacity on low-value work – McKinsey states as much as 30% of IT spend could be optimised and reinvested. AI generates even more data and signals, stretching the limits of human-based operations.

To keep pace, CIOs must move from reactive, labour-intensive processes to automation-led, policy-driven and increasingly autonomous operations embedded into the infrastructure lifecycle.

The constraint is no longer the technology itself. It is the ability to operate it efficiently at scale.

D. The shift from infrastructure ownership to infrastructure experience

Multi cloud adoption has become the default enterprise model, delivering flexibility and resilience. However, it has also introduced a new form of complexity.

Most organisations have achieved cloud choice but not cloud coherence. Connectivity, security and policies are often defined independently within each environment, creating fragmentation as scale increases. The result is unmanaged inter-dependencies, policy drift and rising costs, particularly from duplicated architectures and uncontrolled data movement.

Cloud without coordination does not simplify infrastructure - it fragments it. The next phase of maturity requires consistent architecture, governance and control across all cloud environments, not within them.

E. From infrastructure metrics to business outcomes

CIO accountability has shifted. The question is no longer whether infrastructure is available - it is whether it is enabling business outcomes.

Boards now focus on why **revenue** - impacting services fail, why costs fluctuate and why transformation slows. This requires CIOs to translate complex technical signals into clear, defensible business insight.

The value of infrastructure is no longer measured in technical metrics, but in the business outcomes it enables - or constrains.

In fragmented environments, that translation becomes difficult. Root causes are unclear, cost drivers are opaque, and accountability is harder to articulate.

CIOs must therefore shift from reporting on performance to demonstrating impact, control and predictability at a business level.

A necessary shift, not an optional evolution

These shifts reflect a fundamental change in how enterprise technology operates. Infrastructure is no longer a collection of components - it is a dynamic, interdependent system that underpins every aspect of the business.

Organisations that continue to operate fragmented, manually managed environments will find that complexity compounds faster than they can control it, particularly as AI accelerates scale and dependence on real-time systems.

Those that succeed will be the ones that bring structure, visibility and coordination across their entire digital estate. This is the context in which new architectural models are emerging - designed not to eliminate complexity, but to make it visible, orchestrated and controllable at **scale**.



Simplifying complexity with Tata Communications Digital Fabric

If complexity is structural, the solution must also be structural. Enterprise complexity cannot be eliminated by adding more tools, clouds, or point solutions.

Complexity is most effectively reduced when:



Connectivity, cloud, security and edge are operated as a single system



Visibility, control and automation are designed into the architecture, not layered on afterwards



Enterprises operate through a unified orchestration and observability layer rather than fragmented domains

This requires a different architectural approach - one that treats connectivity, cloud, security and operations as a coordinated system.

Tata Communications Digital Fabric provides this foundation. It is an integrated, modular architecture designed to simplify, consolidate and automate enterprise infrastructure at global scale. It delivers a vendor-agnostic foundation spanning network, cloud and services environments, unified through orchestration and observability.

Rather than replacing existing systems, it introduces a unifying layer across the enterprise estate—bringing structure, visibility, coordination and intelligence across network, cloud, security and edge environments.

A. How the Digital Fabric translates architecture into business outcomes

Characteristic	What it enables	Operational impact	Business outcomes
Fabric, not point solutions	A unified connectivity and cloud architecture spanning user to cloud, cloud to cloud and edge	Eliminates duplicated architectures and fragmented operating models	10–30% reduction in total IT run-rate cost by removing overlapping tools, platforms and integration effort 20–40% faster change cycles through fewer handoffs and simpler decision paths
One backbone, global reach	A wholly owned Tier 1 global network underpinning cloud and internet access	Predictable performance, standardised experience and built-in resilience	Material reduction in outage exposure , where downtime can cost £100k–£500k per hour Consistent application performance supporting global digital and AI workloads
Vendor-agnostic integration	Seamless integration with existing OEMs, clouds and operational tools	Avoids rip and replace transformation and protects prior investment	Avoids multi-year transformation delays typically associated with platform replacement Accelerates modernisation while preserving sunk capital and commercial contracts
Built-in orchestration & observability	End-to-end visibility and policy-driven control across network, cloud and security	Faster incident response, clearer accountability and proactive governance	Up to 60–65% reduction in Mean Time to Resolution (MTTR) 20–40% reduction in operational toil , freeing teams for innovation and AI enablement

B. The Digital Fabric drives consolidation across three critical layers

Connectivity & network consolidation

- MPLS, internet WAN, SD WAN, SASE, cloud connectivity integrated into a single network fabric
- Centralised policy definition and enforcement across regions and access types
- Standardised service experience, regardless of location



Outcome:
Lower run-rate costs / reduced vendor sprawl / faster global scalability.

Cloud connectivity & multi cloud networking consolidation

- Unified Multi Cloud Connect and Multi Cloud Networking architecture
- Simplified cloud to cloud and data centre to cloud connectivity
- Consistent networking patterns across AWS, Azure, GCP, and private clouds



Outcome:
Faster cloud deployment / reduced dependency on hyperscaler-specific specialists / improved cost control and egress visibility.

Operational & tooling consolidation with ThreadSpan™

At the core of the Digital Fabric is a real-time observability and orchestration layer that spans network, cloud, security and edge. It correlates data across domains and translates technical signals into business-relevant insight, reducing reliance on fragmented monitoring, configuration and automation tools.

By surfacing visibility, orchestration and policy management through a single control plane, it enables faster decision-making and consistent governance across the estate.



Outcome:
Faster root-cause analysis / clear accountability across teams and suppliers / CIOs can explain ‘why’ something broke, not simply ‘what’ broke.

Customers using our ThreadSpan™ solution have achieved:

25% reduction in critical incidents	Up to 65% faster mean time to resolution	Stronger compliance and operational confidence
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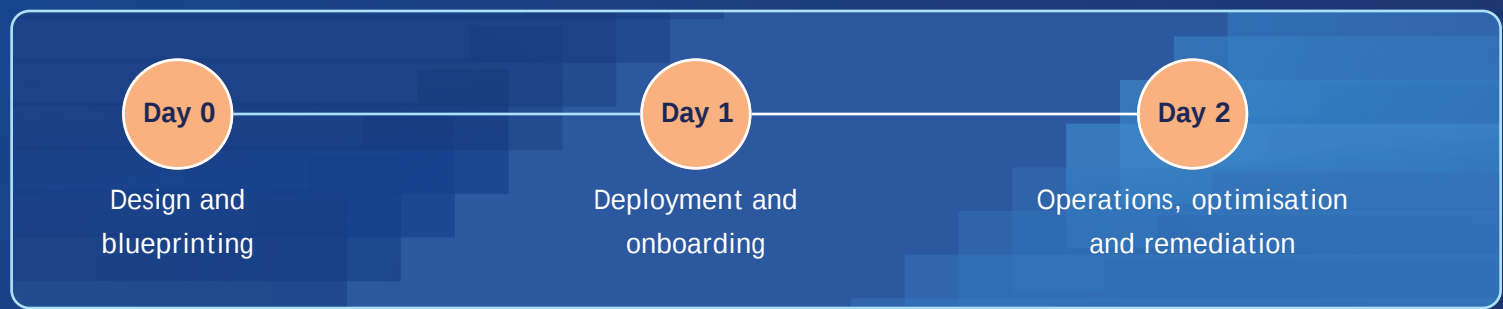
C. Automation at scale: From manual operations to AI-assisted execution

If consolidation simplifies the architecture, automation enables it to operate at scale.

Why automation must be fabric-level. In large, distributed enterprises, manual operations do not scale:

-  Cloud networking deployments involve dozens of manual steps
-  Policy inconsistencies introduce security and compliance risk
-  Incident response spans multiple teams and platforms

Tata Communications' Digital Fabric embeds automation across the lifecycle



What automation enables

Capability	Impact	Business value	Quantified benefit (with source)
Automated provisioning	Faster rollout of sites, clouds and workloads	Reduced time to market	50–70% faster process cycle times through workflow automation at scale. <i>Gitnux</i> Up to 77% reduction in time spent on repetitive manual tasks , accelerating delivery timelines. <i>ServiceNow</i>
Policy-driven operations	Consistent security and network behaviour	Lower compliance risk	Up to 60% improvement in compliance outcomes with automated workflows in regulated environments. <i>Gitnux</i> 65% of organisations prioritise automation to reduce compliance complexity and operational overhead. <i>JumpCloud</i>
Predictive operations	Anticipate congestion, failures and performance issues	Improved availability	Up to 50% reduction in unplanned downtime through predictive, AI-driven operations

Automation delivers measurable gains in speed, cost efficiency and resilience, turning operational complexity into predictable, controllable performance at scale. Gartner highlights that AI-driven automation is becoming essential for managing the scale and velocity of modern IT environments, where data volumes exceed human capacity for analysis and response.

Our Digital Fabric modular solutions combine to simplify infrastructure at scale

Translating this architecture into practice requires modular, scalable capabilities that can be deployed without disrupting existing environments.

Through solutions such as DC Dynamic Connectivity, Internet WAN, SD WAN, Multi Cloud Networking and Multi Cloud Connectivity, Tata Communications enables enterprises to replace static, fragmented infrastructure with elastic, intelligent and visible digital foundations - without disruption.



DC Dynamic Connectivity - Transforms static DC to DC links into elastic, self-healing connectivity with deterministic performance for AI workloads.



Internet WAN - Delivers right-fit global internet with predictable performance, faster deployment and lower total cost of ownership.



SD WAN - Enables automated discovery, policy optimisation and AI-assisted assurance across large estates.



Multi Cloud Networking & Connectivity - Provides consistent architecture, visibility, security and control across all cloud environments.



ThreadSpan™ - Closes the visibility, tool and AI gaps - turning insights into action across the hybrid lifecycle.

Conclusion

Complexity itself is not the enemy. Unmanaged complexity is.

Modern digital environments have evolved into highly distributed, interdependent systems that were never designed to operate as a single whole. AI is accelerating this reality - exposing hidden fragility and intensifying the cost of fragmentation.

Tata Communications' Digital Fabric does not promise a world without complexity. It enables enterprises to understand, control and operate complexity at scale - turning fragmented infrastructure into a coordinated, observable, and intelligent system.

In a world defined by AI acceleration, geopolitical uncertainty, and relentless digitisation, organisations that win will not be those with the most technology, but those that can operate it with clarity, control and confidence.

CIO recommendations and next steps

The path forward for CIOs is not incremental, but a shift in how enterprise technology is designed and operated as a whole. This begins with moving from siloed domains to integrated architecture, where network, cloud and security are managed as one system. At the same time, organisations must evolve from reactive operations to predictive, intelligence-led models that anticipate and prevent disruption. This requires reducing tool sprawl and adopting platform-based approaches that provide unified visibility, control and automation across environments.

Equally important is the move from vendor fragmentation to coordinated ecosystems, where multiple technologies and providers are orchestrated through a common operating layer rather than managed independently.

Ultimately, these changes enable the most important transition - from focusing on technical metrics to delivering measurable business outcomes, ensuring infrastructure directly supports growth, resilience and transformation at a C-suite level.

Why Tata Communications

Tata Communications delivers a fundamentally different model for global digital infrastructure - one built on end-to-end integration, ownership and intelligence at scale, rather than fragmented, domain-specific services.

Its Digital Fabric unifies connectivity, cloud, security and orchestration into a single, coordinated system, underpinned by a **Tier 1 global network spanning 190+ countries and territories, serving 5,000+ enterprises including 300 Fortune 500 companies, and carrying around 35% of global internet routes**. This is reinforced by 500,000+ km of subsea cable and 200,000 km terrestrial fibre, providing the scale, control and resilience required to deliver consistent performance across complex, multi-region environments.

Beyond connectivity, Tata Communications is architected for the AI era - enabling enterprises to move from experimentation to scaled adoption with confidence. Through its Digital Fabric and AI-driven platforms such as ThreadSpan™, it embeds observability, automation and policy control directly into the infrastructure. This creates a unified operating layer across multi cloud and multi-vendor environments, supporting data-intensive, latency-sensitive AI workloads.

This approach reduces complexity, accelerates execution, strengthens resilience and provides the visibility and governance expected at board level. In a market still defined by siloed solutions, Tata Communications enables enterprises to operate as one cohesive, intelligent system - Together, limitless.

Take the next step now. Explore tech complexity within your own organisation with a 2-hour, no-obligation complexity assessment.

For more information, visit us at www.tatacommunications.com

Contact us

