

Smart cities: the future of a Digital India

TATA COMMUNICATIONS AS A TECHNOLOGY ENABLER OF INTELLIGENT SOLUTIONS

The purpose of this white paper

The role of technology is pivotal for any smart city initiative and engaging with the right technology partner is imperative for its success. This white paper has been written to provide insights into how Tata Communications can provide technology solutions that will enable the smart city mission.

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1.0 The need for smart cities

How India's cities must adapt to address the urban shift

Cities represent both enormous potential and challenges for achieving growth. On the one hand, they drive economic growth and productivity and serve as hubs of excellence and innovation. On the other, they require a constant adaptation to serve an ever-growing population influx.

As increasing numbers of citizens migrate to cities, the demand for services and resources continues to increase. In fact, the World Bank predicts that over the next two decades, India's urban population will more than double to 590 million.¹

The challenge, therefore, for the Government of India (GOI) is to manage this rapid urban growth by providing improved infrastructure and ensuring sustainable economic performance. GOI has already started to address many of these challenges, using technology that can leapfrog the bottlenecks of weak infrastructure and power India's digital transformation.

A significant step towards this is the Digital India initiative – a vision to transform India into a digital state with the Government interfacing with citizens, businesses and itself through the digital enablement of services and infrastructure.

Digital India – driving smart cities

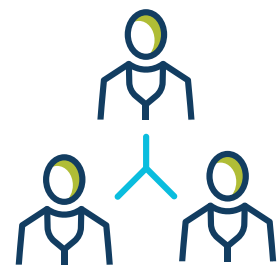
GOI launched Digital India with a vision to transform the country into a knowledge economy and digitally empowered society. It's centred on three key areas:



Development of secure and stable digital infrastructure



Delivering Government services digitally



Digital empowerment of citizens

Creating smart cities is one of GOI's prime initiatives to make technology accessible to its citizens, with a proposal to cover 100 cities between FY2015-16 and FY2019-20. With an expansive agenda involving extensive planning of land use, inclusive housing, viable transport options, citizen-friendly governance, improved utilities and sustainable economic development, technology will play a pivotal role in successful development of smart cities.

What makes a city smart is how it uses technology to deliver real-time outcomes for its citizens. This means it's crucial to the success of any smart city initiative that its technology base is secure, scalable and future-ready.

2.0 The road ahead

Technological challenges facing the development of smart cities

India aims to build 100 smart cities that will transform its infrastructure, economy and digital connectedness. Smart cities are built around communication – and seamless, reliable and ubiquitous connectivity is one of the key enablers.

Unless smart cities are being built from scratch – a luxury unavailable to most Governments – then modern communication systems must usually be retrofitted over the infrastructure already in place. These systems must allow access to real-time data, allowing analysis to be reviewed and acted upon by both city administrators and citizens. It's this integration of data into the decision-making process which truly makes these cities 'smart'.

Successful transformation to a smart city relies heavily on technology and its underlying infrastructure.

Key technology enablers



Cloud infrastructure hosting



Cloud operations



Service management



Governance



As such, there are several technological challenges that any proposed smart city solution must be able to meet:



Real-time inputs and integrated solutions

Put simply, the more data, the better the insights. Smart cities can only operate using the data they capture and record, so widespread sensors are a crucial component. What's more, a platform is needed to compile these data points, run the analysis and deliver actionable outputs to decision-makers. Future predictions, preventative action and real-time delivery of services will become possible only if the technological base to perform such analysis is in place.



Utilising the cloud to manage data and services

Given the enormous volumes of data produced by smart cities, solutions that can scale rapidly are crucial. Cloud computing already allows greater accessibility as well as scalability for the delivery of services, and its capability to provide the processing power needed to analyse an entire city will only fuel its rapid and widespread adoption further.



Cybersecurity confidence and control

Without appropriate security, a smart city is a sitting duck. As the points of entry into the broader network expand, planners must ensure that the highest standards of security protect personal data, critical applications and essential services.



Enabling networks

Connecting such a vast array of sensors requires oversight of the entire communication infrastructure, allowing applications as disparate as traffic monitoring, home security and energy consumption to be processed simultaneously. Technological solutions to this problem will vary from fibre optics to short-range communication systems such as Bluetooth LE, RFID, ZigBee and more. Understanding of all these technologies and the skill to integrate them will be a limiting factor in the success of any smart city network.



Increased Government collaboration

Unified oversight of residents, services, information and knowledge will be the ultimate aim in breaking down walls between separate functions. To realise the benefits of collaboration – such as innovation, understanding and improved decision-making – digital transformation must be made a priority.



Greater citizen engagement

For collecting feedback on conditions in real-time, or receiving reports on social issues such as crime, the development of multiple channels for transparent and timely engagement with citizens is a crucial step. Importantly, mobile-optimised solutions will have a pivotal part to play – which means enabling collaboration channels is a prerequisite for any technology partner or provider.

3.0 Tata Communications smart city framework

Enabling development of comprehensive smart solutions

At Tata Communications, we understand and appreciate the nuances around digital transformation. We've worked with thousands of global customers on their digitisation journeys, and we're honoured to play a pivotal role in the co-creation of critical Government e-initiatives like the Government e-Marketplace and smart city projects. We're also a MeitY-empanelled cloud service provider and have set up a dedicated Government Community Cloud.

The Indian economy is poised for growth, and we look forward empowering smart city projects with our technology solutions and working with the Government on initiatives that will accelerate inclusive growth and sustainable development.

Our comprehensive smart cities framework focuses on three pivotal areas:

Intelligent smart city solutions



Integrated infrastructure

Collaboration solutions

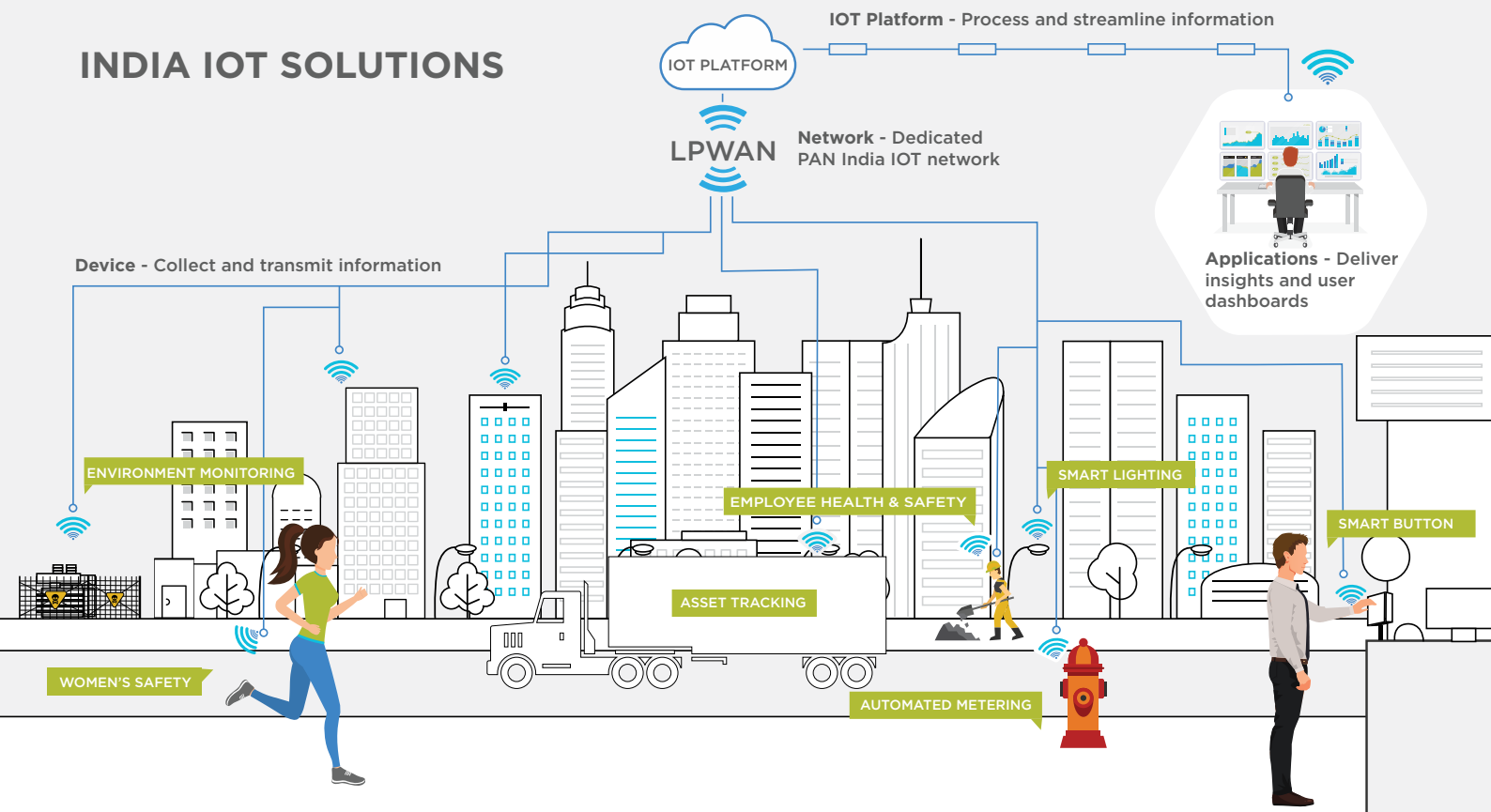
4.0 Intelligent smart city solutions

Internet of Things (IoT), opening doors to a connected world

Internet of Things (IoT) has become a promising technology for addressing social challenges – connecting smart devices and enabling big data analytics for creating intelligent ecosystems worldwide. The information and analytics from IoT and Big Data find significant application in optimising a city's infrastructure, keeping citizens connected and secure, and using its resources more efficiently.

Tata Communications is at the forefront of IoT development in India – offering innovative, comprehensive and scalable solutions for smart cities and their citizens. Our end-to-end solutions are powered by state-of-the-art devices running on our dedicated IoT network, platform and applications.

Key smart city solution areas





Asset tracking solutions to track and monitor data from your city's critical assets across location, movement, temperature, voltage and vibration using our state-of-the-art sensors. Helping to reduce asset loss, increase asset utilisation and prevent misuse.



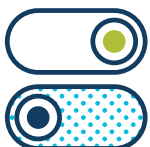
Smart metering solutions for automated metering to track expanding utility consumption. By connecting smart meters or retrofitting smart modules to existing manual meters, Tata Communications enables automated meter readings, consumption pattern monitoring and demand-supply management ensuring service level improvements and improved efficiency.



Environmental monitoring solutions for full visibility and control of environmental conditions for essential facilities and assets in cities – enabling maintenance of optimal parameters. When parameters cross preset thresholds, our solutions provide insights for corrective actions, helping city administration reduce downtime and cut maintenance costs.



Smart lighting solutions enable two-way communication between street lights and the City Command Centre, providing unified control of widely distributed street lights. Administrators can define and automate the behaviour of street lights based on insights – optimising energy consumption and enabling predictive maintenance.



Smart button solutions to harness the power of feedback and address citizen service requests conveniently with a simple click. Our solutions can enhance customer experience at city facilities for proactive remedial measures and to prevent misreporting of service levels.



Women safety solutions to empower women with smart wearable safety devices that track and record user movement, and issue alerts for help when triggered. Our easy-to-use devices have extensive reach and operate on low power technology for extended battery life ensuring failsafe security.



Employee health and safety solutions to monitor workers vital stats and work environment conditions – helping to prevent accidents and safety incidents at work, improving the productivity of city's workers. Our solutions also help to reduce administration liabilities due to injury.

KEY FEATURES OF OUR COMPREHENSIVE IOT SOLUTIONS



IoT dedicated Low Power Wide Area Network (LPWAN) for an extended range and low power consumption of deployed devices



Highly scalable plug and play solutions with quick deployment times



Network and application level security offering enhanced protection of critical data across smart solutions

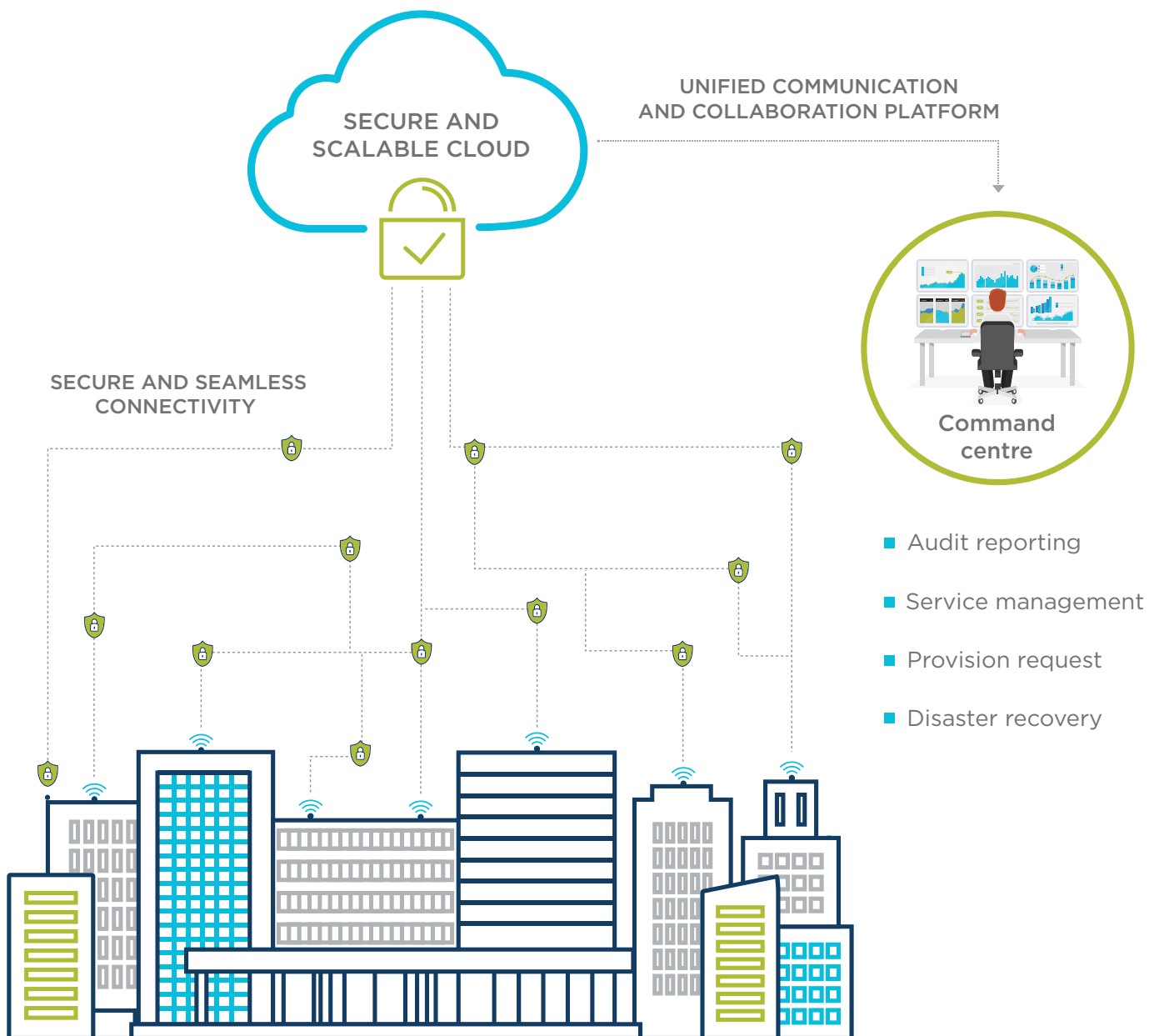


Cost-effective solutions for a faster return on investment and best utilisation of public funds

5.0 Integrated infrastructure

A powerful enabler of smart cities

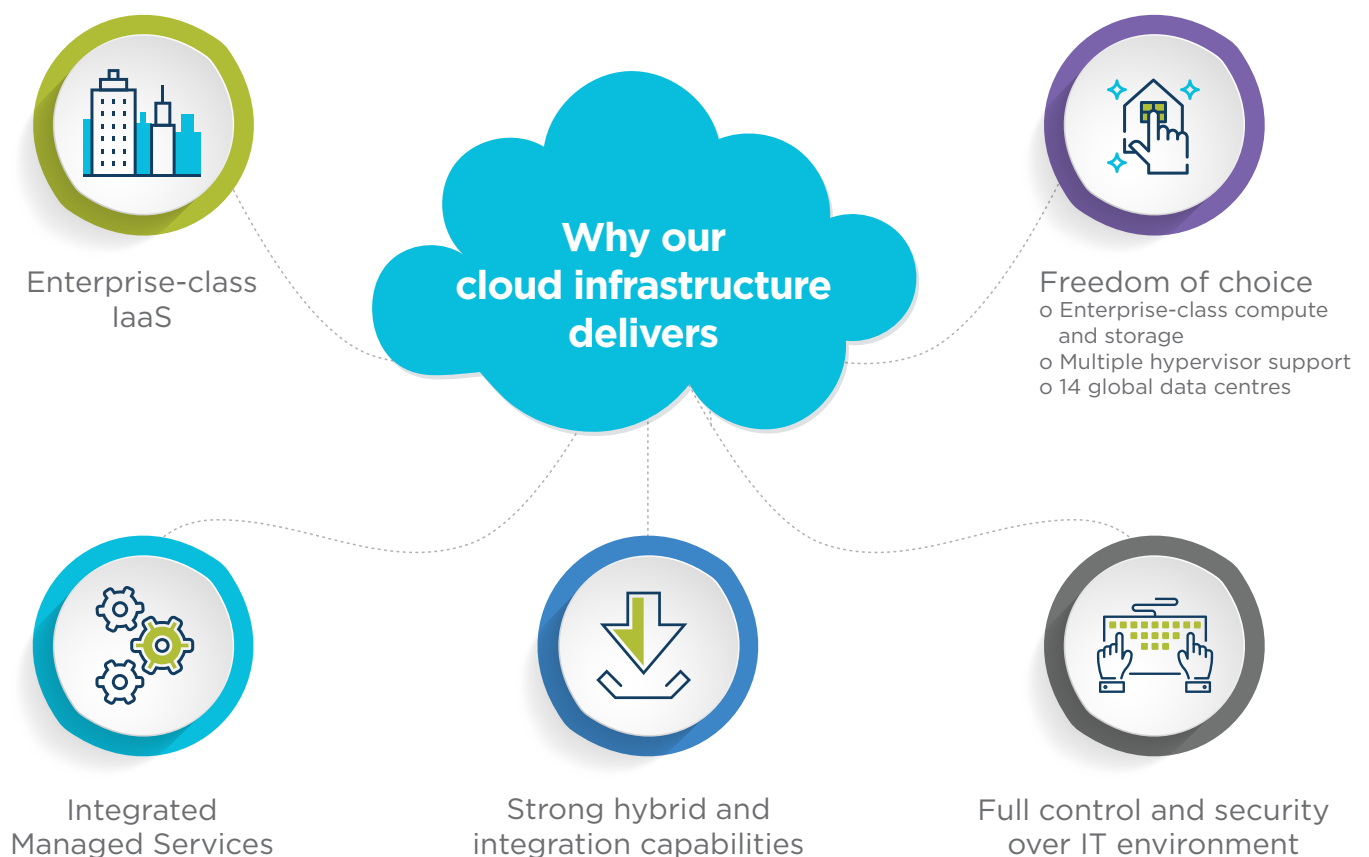
Smart cities need an integrated technology infrastructure approach to harness the full potential of smart solutions. Tata Communications is one of India's leading infrastructure providers, with a comprehensive portfolio of services covering fundamental building blocks of smart city enablement.



5.1 Tata Communications' cloud platform

With intelligent and connected devices generating unending streams of data, it's essential to have a secure, scalable and accessible processing and storage solution – the cloud. Tata Communications cloud solutions offer rapidly growing smart cities the ability to scale seamlessly, expand rapidly and stay flexible without ever compromising security. They also integrate seamlessly with our Managed Big Data solutions allowing government and enterprises alike to unleash the power of data analytics by consolidating inputs from various sources for intelligent decision making.

Tata Communications' cloud infrastructure is powered by OpenStack cloud, which provides an ideal platform to deliver enterprise-ready technology for building Infrastructure-as-a-Service (IaaS) private clouds. It gives you access to automated pools of IT resources to develop and run applications and workloads efficiently and closely integrating with enterprise storage.



5.2 Government Community Cloud

As a GOI-empanelled cloud service provider, we offer secure and efficient Hybrid Cloud infrastructure to build smart city solutions – including the creation of a dedicated Government Community Cloud (GCC). It ensures that smart cities can be administered without any scalability or service continuity challenges.

Characteristics of GCC cloud platform:

- Infrastructure powered by Redhat OpenStack cloud
- Capability to provision and de-provision virtual machines within 15 minutes
- Capability to create multiple versions of the same infrastructure
- Robust security and compliance control
- Ability to consume shared infrastructure while maintaining logical segregation
- Standardisation to bring operational stability and drive down the costs
- Self-service portal to provision infrastructure

Our GCC offers:



1. Information security: Tata Communications' Government Community Cloud (GCC) is built to adhere to stringent mandatory requirements and essential compliances such as:

- ISO 27001 – a standard to keep information assets secure
- ISO/IEC 27017:2015 – a code of practice for information security controls
- ISO 27018 – a code of practice for protection of personally identifiable information (PII) in public clouds
- ISO 20000-9 – guidance on the application of ISO/IEC 20000-1 to cloud services
- PCI DSS – compliant technology infrastructure for storing, processing and transmitting credit card information in the cloud
- The Global Service Management Centre (GSMC) provides NOC and SOC services compliant with ISO 27001:2013 and ISO 20000-1:2011
- Tier-III compliant and ISO 27001:2013-certified data centres



2. Audit and reporting: Our GCC offering is fully compliant with the STQC and GOI audit requirements. We also meet compliance standards such as ISO 27001, ISO 27018 etc.

- Performance management: We offer auto-scalability to accommodate any unplanned data surge in real time. Our cloud is also scalable and redundant for managing the vast amounts of data flow expected in smart cities.



3. Service management and provisioning requirement

The GCC allows customers to provision independently for:

- Virtual machines (VM) configuration and operating systems
- Services via application programming interface (API)
- Defining virtual firewall rules and giving users remote access
- Hardware resource monitoring and upgrading
- Operating system hardening and patch management
- Customer alerts in the event of deviations

Our self-service portal gives customers the flexibility to:

- Monitor real-time performance, manage thresholds and view historical data
- Run service level reports
- Check outage records, causes and corrective actions taken
- Raise tickets and track progress



4. Disaster recovery

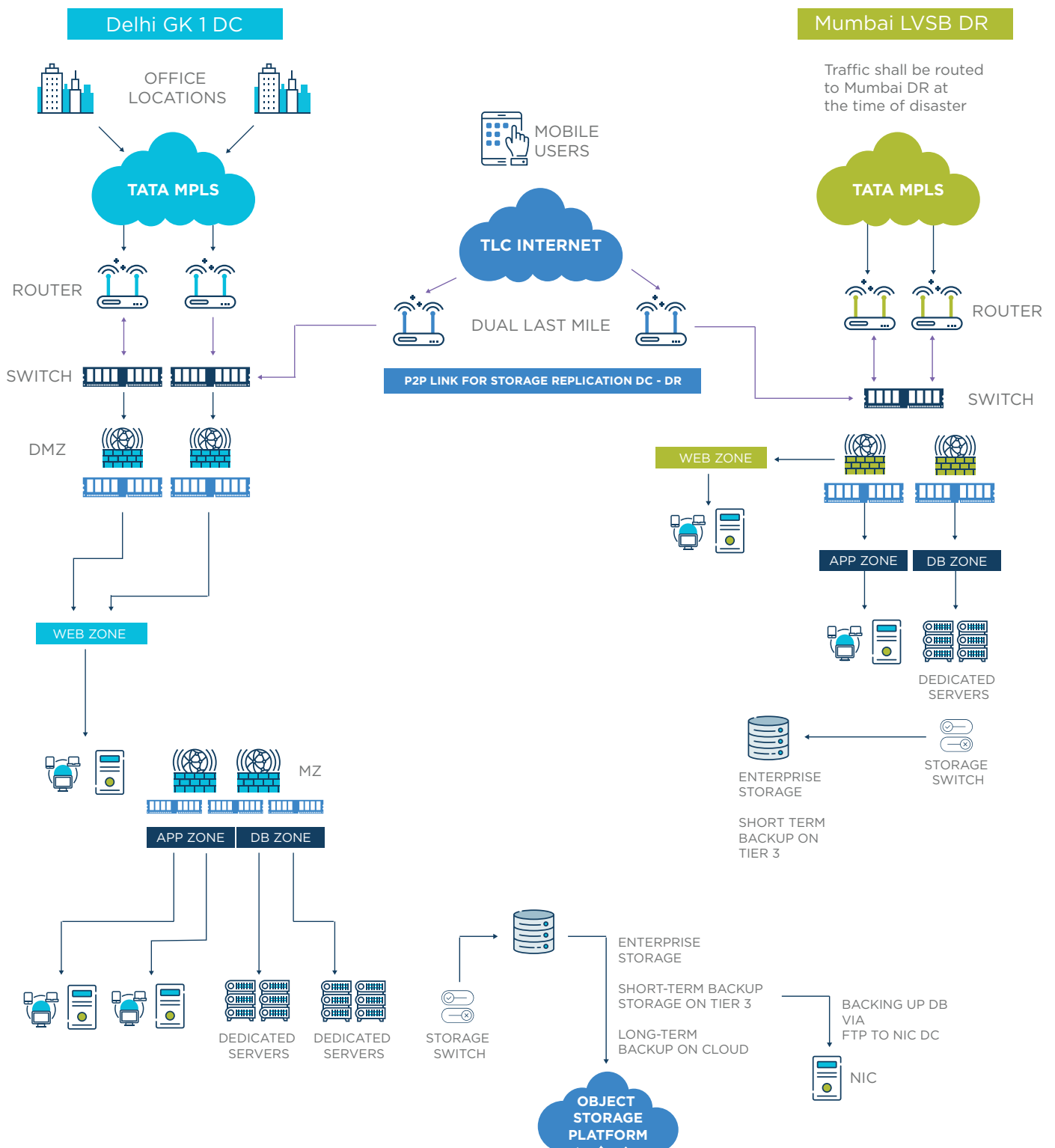
Tata Communications set up the GCC with its primary data centre and DR sites located in different seismic zones to ensure full operational continuity of critical Government departments in the event of a primary data centre failure.

- Our data centres are Tier-III compliant and ISO 27001:2013 certified. They are also assessed for SSAE 18/ ISAE 3402 standards.
- We have provisioned for the required Recovery Point Objective (RPO) and Recovery Time Objective (RTO).

DC-DR ARCHITECTURE

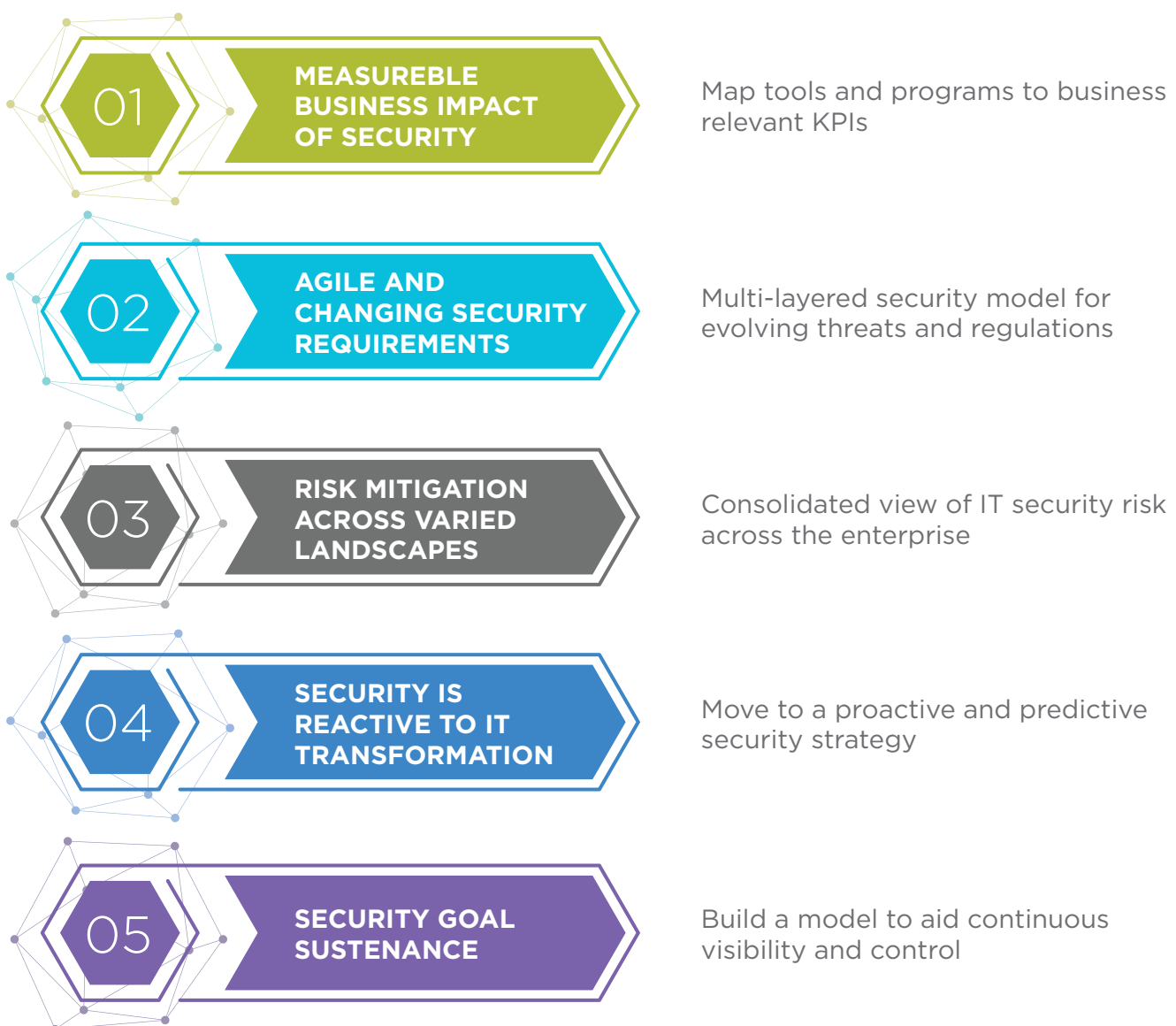
Tata Communications has proposed primary datacenter at Delhi GK-1, with its active failover in Mumbai LVSB. Tata Communications has provisioned the cloud infrastructure as per the requirement shared by International Development Association (IDA).

- The GeM system is envisaged as a faceless system with 100% API driven architecture at the core
- Auto-scaling functionality and 15% headroom built into the platform, without disrupting application performance / user experience
- Cloud platform architecture is in line with MEITY approved GCC framework

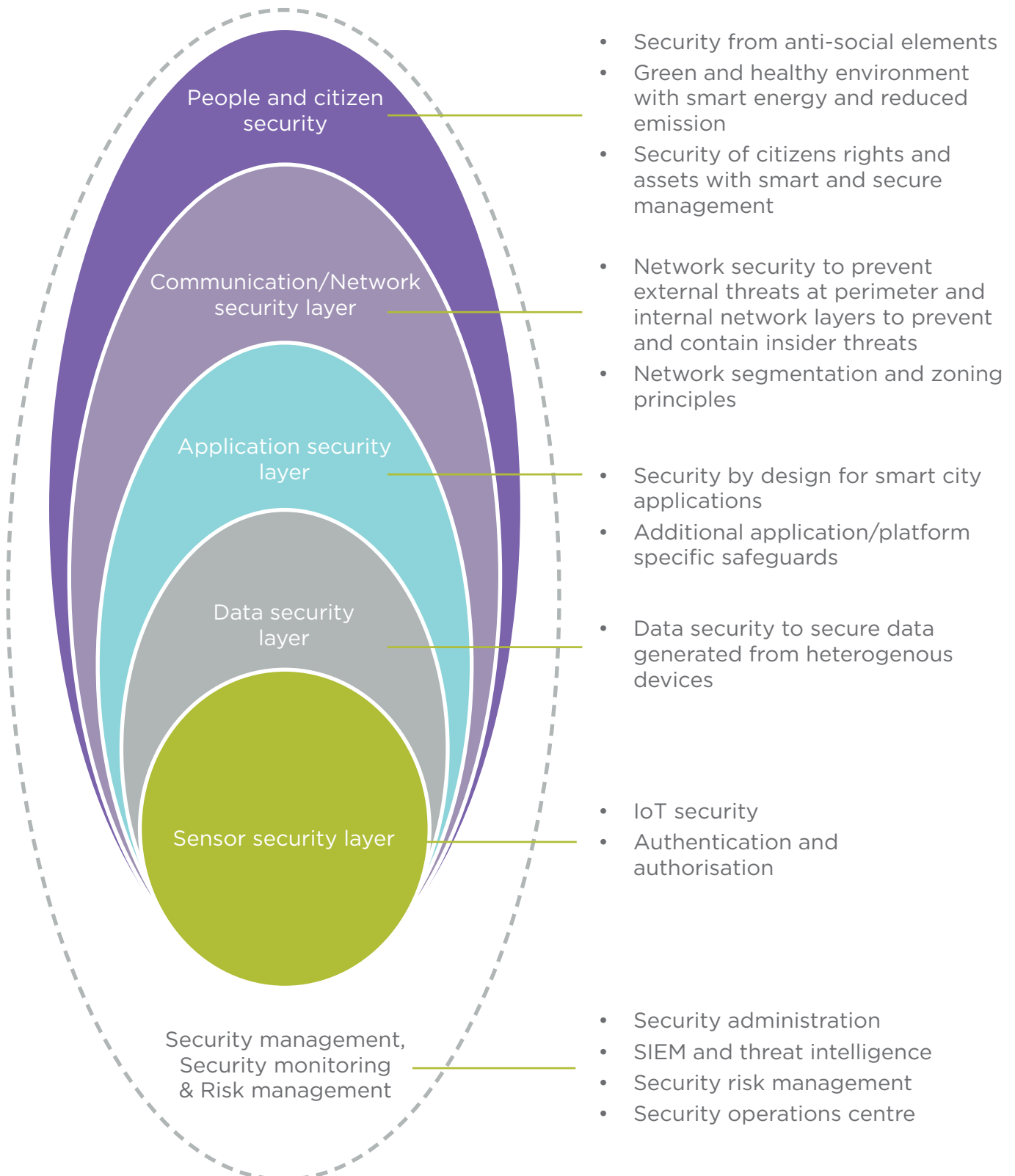


5.3 Tata Communications' Managed Security Services

The successful administration of smart cities depends on seamless and successful data flow and connectivity – making threats from cyber-attacks and malware even more concerning. Tata Communications' multi-layered, integrated and trusted security framework can defend smart city applications and infrastructure from attacks on networks, endpoints, applications, data and identity.



Smart city – Security architecture



Comprehensive security provisions



Application and endpoint security: Our multi-layered security framework is based on intelligent threat modelling and real-time understanding of risks including user authentication – ensuring safe and secure access to all your applications.



Threat management: We provide advanced detection and mitigation techniques to protect your business against IT security threats, which include real-time monitoring, proactive reporting, data analytics, breach alerts and machine learning. Our team is working 24/7/365 to neutralise risks while strengthening your defence.



Governance, risk and compliance: With rampant cyber-attacks and security breaches, we help you navigate fast-evolving regulatory norms across different geographies. Our risk and threat management services can reduce the impact of security events and eliminate business losses by preventing potential security and data breaches.



Cloud security: Our comprehensive suite of security solutions is cloud-based and provides end-to-end security to the critical applications based on our cloud.



Content security: We ensure complete protection of your applications and data against all kinds of attacks and breaches, providing absolute privacy and peace-of-mind.



Network and infrastructure security: For end-to-end security, Tata Communications offers a range of solutions that deliver real-time detection and mitigation by blocking malicious traffic while allowing legitimate traffic to flow.

Certified security experts fully manage our security services, providing a matured security event correlation framework for 24/7/365 event monitoring services and incident response.

5.4 Tata Communications' network services

Smart city solutions need seamless connectivity for devices and an uninterrupted flow of data between sensors, administration and citizens. This makes network connectivity an essential part of the smart city ecosystem.

Tata Communications is powered by the world's most extensive global Tier-1 network. We've been positioned as a Leader in the Gartner Magic Quadrant for Network Services, Global for five years in a row. We also own and operate the world's largest and most advanced subsea fibre cable network. Today, over 28% of the world's internet routes travel over Tata Communications' network, which enables robust direct network connectivity leading to end-to-end control of traffic, better latency and higher performance.

And we have more than 240 IP Points of Presence (PoP) on six continents – for reliable, scalable internet connectivity wherever your business takes you.

Smart cities' use of cloud and digital technologies requires agile and smart cloud-ready Wide Area Networks (WAN) to connect traditional and emerging network endpoints. Our network offerings are ready to help power smart solutions:



Tata Communications Global VPN/MPLS (Multiprotocol Label Switching) connectivity

routed over our robust and reliable network backbone. Our GVPN (MPLS) coverage in India extends to 122 PoPs. We use local lease lines or long lines to cover cities where we do not have PoP.

Additionally, we give you SDWAN capability that has inbuilt intelligence to maximise network performance and user experience – combining Hybrid WAN with cutting-edge software-defined and virtualised network technologies.



Internet access: Fast, dependable and always on, our internet services offer reliable access for enterprise and customer operations across India. Thanks to our IPv6 dual-stack network capability, and peer relationships with more than 50 partners worldwide, our internet access is among the best in the world.



Cloud network access: Tata Communications' cloud enablement services offer scalability and flexibility to meet your needs with enhanced security and complete support.

- **Seamless access to cloud providers:** Enterprise WAN links users and applications to clouds including Amazon Web Services, Microsoft Azure, Google, IBM and Alibaba.
- **Intelligent routing:** Application aware routing based on business policies and network conditions to ensure application performance.
- **Network segregation for workload VMs:** Workload VMs can be part of different subnets as per requirement, to segregate users.
- **VLAN based network isolation:** Cloud deployment is based on VLAN segregation, so varying services are placed in different zones. Public facing services are segregated from application services. Database nodes are provisioned in a separate higher security layer.
- **Low latency:** Seamless performance and resilience to minimise single point of failure.
- **System and session redundancy:** Capability to switch over automatically to a redundant device upon system or network failure.
- **Scalability:** Highly scalable architecture to provide for future expansion.
- **Throughput:** Eliminate performance bottlenecks due to network devices performance by utilising tiered architecture in the DCs.

5.5 Network compliance

Tata Communications' network infrastructure is IPV6-compliant and fully adheres to controls specified by CERT-In – the national nodal agency for computer security incidents. Our network can scale bandwidth on demand, along with secure private connectivity between customer data centres. Should it be needed, we also have the flexibility to work with other ISPs to provide complete redundancy for the customer's network. We also provide customer networks with virtual firewalls for added security.

6.0 Unified collaboration solutions

Connecting citizens to smart city solutions

The goal of building a smart city is to use urban informatics and technology to improve the efficiency of services and satisfy the needs of its citizens. Hosted contact centre solutions are needed to deliver next-generation customer experience from the City Control Centre, directly to the citizens.

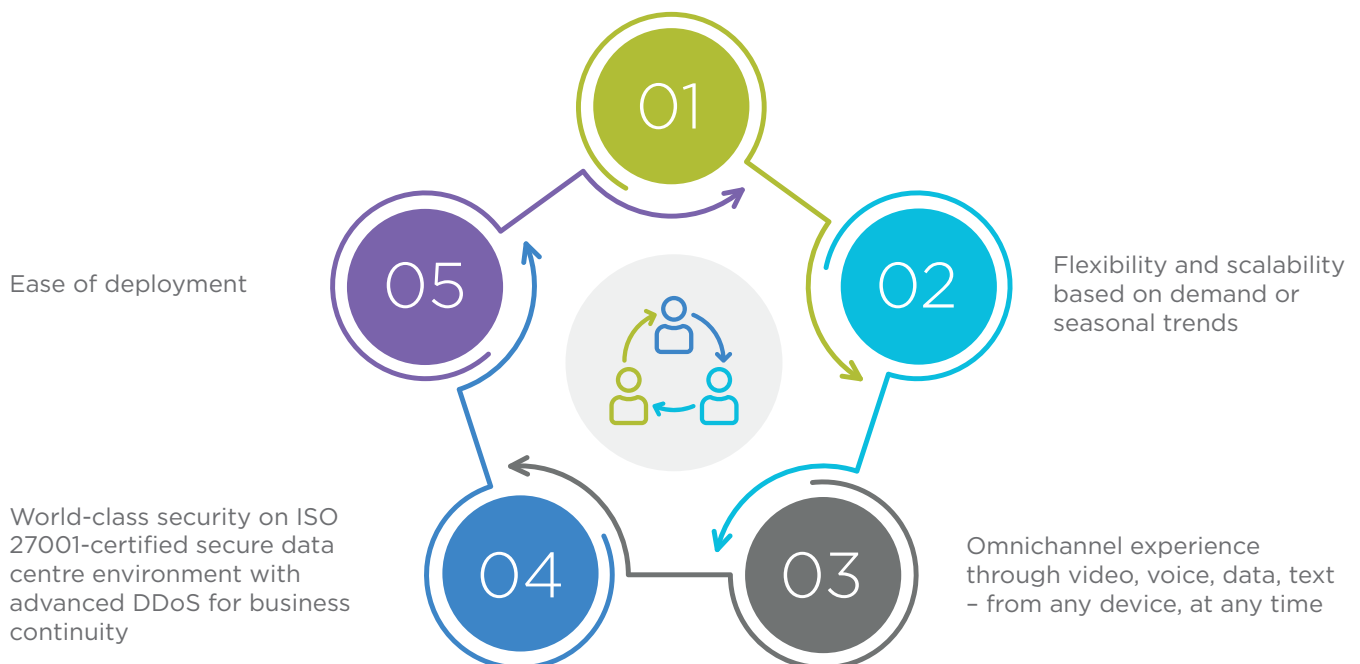
Tata Communications provides a Unified Collaboration solution that improves efficiencies and lowers operating expenditure by connecting teams across the city through a single solution – offering modular, pre-integrated contact centre applications, hosting, data connectivity and voice minutes. In fact, SBI – India’s largest public sector bank – has implemented our solution to manage contact centre requirements worldwide, across multiple delivery centres and with consistent customer experience.

InstaCC Global, our hosted contact centre offering, is powered by Cisco Hosted Collaboration Solution – enabling an end-to-end contact centre solution. Some of its key features go a long way in solving the collaboration needs of smart city applications.

Call quality and uptime

a. Immediate connectivity, minimum latency and best call quality

b. Wholly owned largest sub-sea fibre network in the world for high speed and quality connectivity



For consistently excellent service levels we have also been awarded the prestigious Frost & Sullivan ‘Hosted Contact Centre Service Provider of the Year’ six times since 2011.

7.0 Partnering with Tata Communications

Delivering the capabilities smart cities need

Our experience and effectiveness in enabling smart city solutions, integrated infrastructure and Unified Collaboration makes us a reliable partner for the success of your smart city mission. The following qualities make us an outstanding choice for partnership:



8.0 Conclusion

During our entire 150-year existence, we at the Tata Group have always been deeply committed to improving the quality of life in the communities we serve. The Tata Group is one of the leaders in India's industrial growth story across diverse sectors such as automotive, manufacturing, financial services and technology.

At Tata Communications, we are committed to partnering with the Government of India in its smart cities mission and transforming India to a knowledge economy powered by technology.

Source

1. http://web.worldbank.org/archive/website01291/WEB/0__CO-22.HTM

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