



THE FUTURE TELCO

AN INTELLIGENT CONNECTIVITY HUB

SIMPLIFY | AUTOMATE | INNOVATE

THE FUTURE TELCO will be a pervasive and AN INTELLIGENT CONNECTIVITY HUB rendering smarter, faster, efficient digital services on demand, to improve human interactions with the world around us. For most Communication Service Providers (CSPs), this journey will be a non-linear, complex and an iterative process, spanning across technology nuances, varied business ecosystems and breaking down their own cultural barriers. Embracing technology transformation, clearly defining the transformation strategy and embedding the culture of INNOVATION will become essential first steps to bring this transformative change.

THINK FUTURE - THINK. TRANSFORM.

While CSPs' transformation journeys will be unique, they should be aimed at regaining competitiveness and securing better operational and commercial position. There are common considerations, and using a framework can help accelerate and de-risk these transformation journeys.

- SIMPLIFY | AUTOMATE | INNOVATE

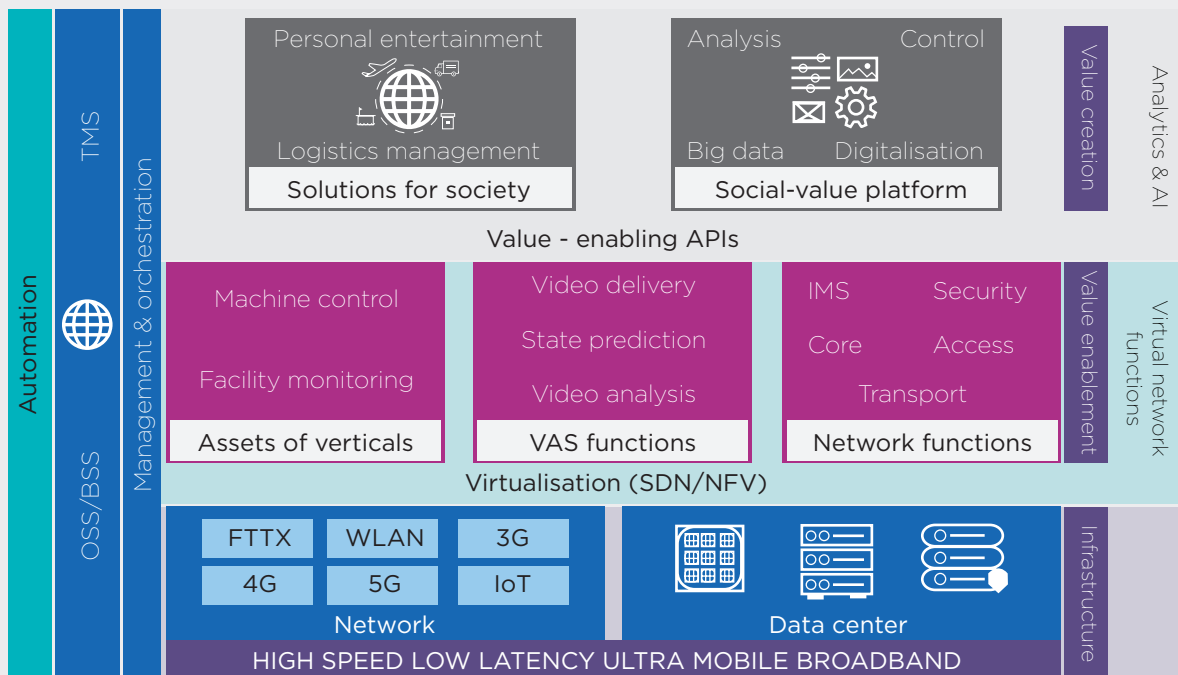
TRANSFORM OPERATIONS to **SIMPLIFY** business for customers, partners and employees. Simplifying business processes to improve network performance, and omni-channel service management to ensure faster service delivery, desired QoS and enhance end-customer experience will be essential starting point.

DRIVE EFFICIENCIES through **AUTOMATION** leading to SMART OPERATIONS. Transformation of CSPs' business processes (service assurance and service delivery), adoption of next gen tools and rapid automation have become critical for CSPs to gain competitiveness and to secure a better operational and commercial position.

INNOVATE - ACCELERATE REVENUES through rapid launch of innovative digital services. CSPs will have to enter new business models offering network infrastructure to business enablement to consumer centric digital services to improve their margins and expect growth in the next decade.

ENHANCE CUSTOMER EXPERIENCE across new-age digital services will become the primary measure of success for all transformation initiatives.

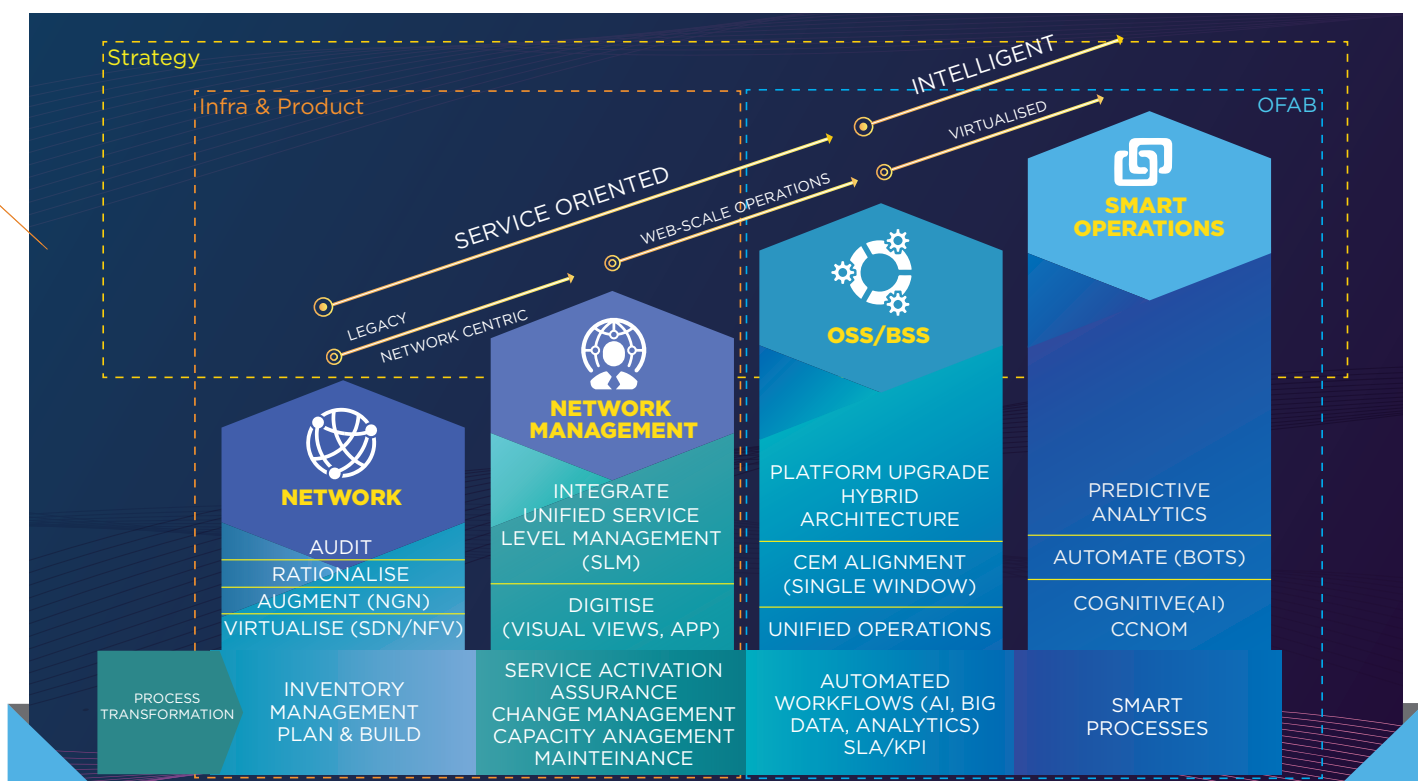
THE FUTURE TELCO (SCHEMATIC)



Tata Communications Transformation Services (TCTS) is a unique **Transformation Services Partner Of Choice** for Communication Service Providers (CSPs), large OTT players and media companies globally.

TCTS offers the industry leading telco transformation framework, which is a culmination of industry research across leading Telcos globally and a decade long experience in managing and transforming one of the world's largest tier 1 carrier networks. The framework identifies various transformation priorities of telcos across six market segments and six domains to illustrate the various options in this journey and with a focus on building the future telco, which is hyper-connected, pervasive, intelligent and customer-centric.

TCTS APPROACH TO TRANSFORMATION



TRANSFORM OPERATIONS WITH A GOAL TO SIMPLIFY BUSINESS

Telcos now are busy to launch new products and services frequently. This has increased complexity across products, business processes, new technology adoption and their governance. The need is to transform their operations by simplifying business processes to improve network performance, and omni-channel service management to ensure faster service delivery, desired QoS and enhance end customers experience.

TCTS enables CSPs to SIMPLIFY their business by facilitating VIRTUALISATION – SDN / NFV, SD-WAN, NEW TECHNOLOGIES ROLLOUT / NGN ADOPTION – 5G, MIMO, Small Cell, 4G / LTE/ LTE-A, High Speed Low Latency Ultra Mobile Broad Band, Next-generation Service Assurance and capacity enhancement (via FTTx, Wi-Fi backhaul), Inventory management and legacy migrations and consolidation.

LEGACY MIGRATION | CONSOLIDATION | CENTRALISATION

CSPs are challenged by rapid technology evolutions, legacy network issues, proprietary solutions, vendor lock-in, and disparate customer management tools that affect their flexibility to address capacity. TCTS brings the real-world experience of OPTIMISING, CENTRALISING AND CONSOLIDATING operations of large, complex global networks of large and different global Telcos, which was the very genesis of TCTS.

TCTS helps CSPs optimise legacy operations, re-engineer service delivery processes, transform network operations and service management tools, slice up networks to deliver different levels of performance and accelerate virtualisation for rapid SDN/ NFV adoption.

VIRTUALISATION

Virtualisation is necessary for telco networks to tap into the digital value chain and enable new service models. In the telco transformation journey, virtualisation is key to driving operational efficiency, agility and service innovation. The transformation rhetoric is incomplete unless the need to overcome saturation in legacy systems is backed by investments in agile, cloud-centric, software-based digital architectures – Software Defined Networks (SDN) and Network Functions Virtualisation (NFV). TCTS virtualisation services help in centralisation of network control and hold tremendous promise to address telco network challenges caused by increased traffic volumes, stagnant revenues and the elastic demands from the cloud. Virtualisation enables new ways of building communication networks at a significantly reduced CAPEX and OPEX with greater scope for innovation in network services, and improved cloud integration enabling revenue opportunities from new digital services.

TEST AUTOMATION

TCTS' Testing Automation Services include a self service portal, lab time slot and elements' booking and scheduling; intelligent power strips allowing complete remote monitoring and end-to-end remote lab management through automatic creation of circuits or patches across equipment.

- Workflow-based test scripting
- Complete control of physical & virtual resources
- CLI, GUI, REST APIs, scripts
- Integration with CI/CD framework
- Custom reports
- Integration with external test tools

SERVICE VALIDATION

TCTS Service Validation offers setting up test beds for OSS/BSS, validation of service chain, provisioning and configuration of orchestration components, virtualised network functions & customer premise equipments and end-to-end network service testing from service provisioning to actual device level configurations.

VNF CERTIFICATION

TCTS works with telcos to help them in network functions test framework with core test suites for functional and system testing, maintenance and readiness of certification labs, request management process, testing VNFs as part of overall testing integrated with external standard tools and preparing test framework on SaaS platform allowing user to create custom tests.

NETWORK MIGRATION

TCTS assists telcos to plan (understand the network and identify core requirements), initiate (functions mapping, and defining operating models), vendor evaluation, evaluating and conducting PoC, and deployment (pre-migration: risk assessment; migration: interoperability with legacy network, integration with existing OSS/BSS systems; post migration: quality of service validation)

HYBRID NETWORK MANAGEMENT

TCTS' Hybrid network management services focus on process re-engineering while NFV adoption, and help in the migration process for effective management of Next-Gen networks.

PREDICTIVE OPERATIONS - AI BASED NOC

TCTS is enabling operators to manage the increasing complexities of networks with growth in transport, Mobility, IP/MPLS and other networks domains. We are also helping telcos to reduce MTTR and optimise OPEX & Total cost of ownership (TCO). Predictive operations further increases network uptime and predictive service assurance, improves customer experience and accelerate revenue generation.

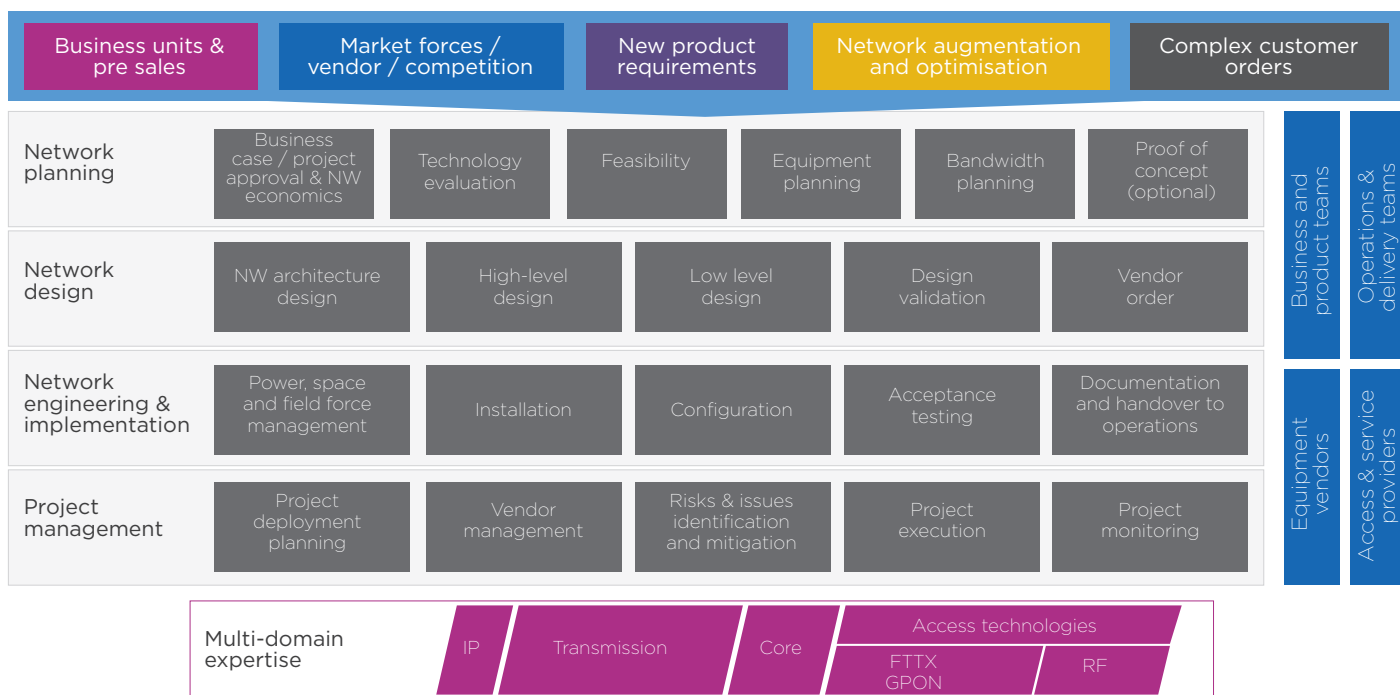
NEXT GENERATION NETWORK PLANNING

The TCTS approach to Next Generation Network Planning involves performing Network Performance & Deployment analysis and proprietary network traffic analysis for predictive business impact. This enables customers to maximise ROI - relative to their most important engineering and commercial targets and objectives - based on better decision making capability using NetView 360® data output.

- NetView 360® provides data analytics and modelling services, generating a wide variety of unique and valuable data driven outputs
- Customers appreciate the flexibility to choose and define outputs most suitable to their needs, integrating them into their business processes

CAPACITY PLANNING AND NGN AUGMENTATION - FTTX, WIFI, BACKHAUL

The continuously changing telecom landscape, rapidly rising demand for higher bandwidth, "quad-play" services, video-on-demand, and IPTV have necessitated the need for next-generation solutions that can enable telecom operators to remain competitive. Fibre-to-the-x (home, premises, building, cabinet, and node) deployment presents an opportunity that can facilitate network transformation for communication service providers, by meeting the commercial, technical, regulatory and organisational objectives.



OSS ORCHESTRATION

With transformation at the core of our business, years of experience in managing telecom operations, TCTS understands the challenges and opportunities in telco transformation and how OSS can synchronise new and legacy networks. TCTS helps telcos build high-performance business operations, make smarter investments in next-gen technologies and enhance business value from existing processes.

TCTS understands telco product offerings, existing systems, business and operational processes to get a holistic view and recommends the OSS strategy, solution architecture, implementation plan and change management plan to enable telco transformation.

5G ADOPTION

5G presents a generational shift in network technology that can drive transformational benefits of revenue acceleration by powering Internet of Things (IoT) / M2M devices. But the question is: are existing infrastructure and network operations designed to support 5G technology. Telcos operating their current 4G/LTE networks have already started to load test their readiness. There are active investments and initiatives to quickly remove bottlenecks from existing legacy networks and transition to an all-IP network.



SETTING UP THE FOUNDATION

Migration from legacy and existing networks to an all-IP network / FTTx

Re-architect the existing network for efficiencies – Next Generation Network Planning & Design



CORE NETWORK VIRTUALISATION

Virtualising network using SDN, NFV, network slicing and virtual testing using Lab as a Service (LaaS)



BUSINESS AS USUAL & PROCESS REALIGNMENT

Managing virtualised and legacy networks, and process realignment using TNOM3 framework



RADIO ACCESS NETWORK (RAN)

Setting up of macro-dominant network (heterogeneous) Cloud RAN (CRAN) and RAN

BUILD CAPACITY AND HIGH SPEED CONNECTIVITY ACROSS TRANSPORT & CORE NETWORK –Deploy fibre deeper into the network



OSS ORCHESTRATION

OSS design, implementation and rollout, audit and transformation consultancy, automation



SMART OPERATIONS

Big Data Analytics, Predictive Analytics, AI and Drones, KPI Standardisation and Customer Experience Building



SECURITY

DRIVE EFFICIENCIES THROUGH AUTOMATION AND TOOLS ADOPTION – AUTOMATE

With focus on delivering excellent customer experience, telcos now are increasingly focusing on driving the quality of network, agility and operational efficiency. Transformation of CSPs' business processes (service assurance and service delivery), adoption of next-gen tools and rapid automation have become critical for CSPs to gain competitiveness and to secure a better operational and commercial position. TCTS works with CSPs to drive operational efficiencies and optimise redundant processes by delivering business excellence, enabling OSS ORCHESTRATION – on demand / service management across channels, Lifecycle Service Orchestration (LSO), Robotic Process Automation (RPA), field force automation, NOC – Service Assurance tools transformation, and Digitisation – Open APIs, Open Digital Architecture (ODA) tools and platforms.

ROBOTIC PROCESS AUTOMATION (RPA)

TCTS facilitates its existing telecom expertise and utilises robotics process automation and platforms to provide "AaaS" to telecom customers (Automation as a Service). TCTS RPA services enable service fulfillment, service assurance and billing services driving efficiency, along with improvements in quality, scalability and resiliency in a cost-effective way.



FULFILLMENT

Order management

Network provisioning

Catalog management

Software configurations

Access & user administration



ASSURANCE

Incident management

Problem & change management

Monitoring

Reporting & dashboards

Test automation



BILLING

Customer billing

Software patch upgrade

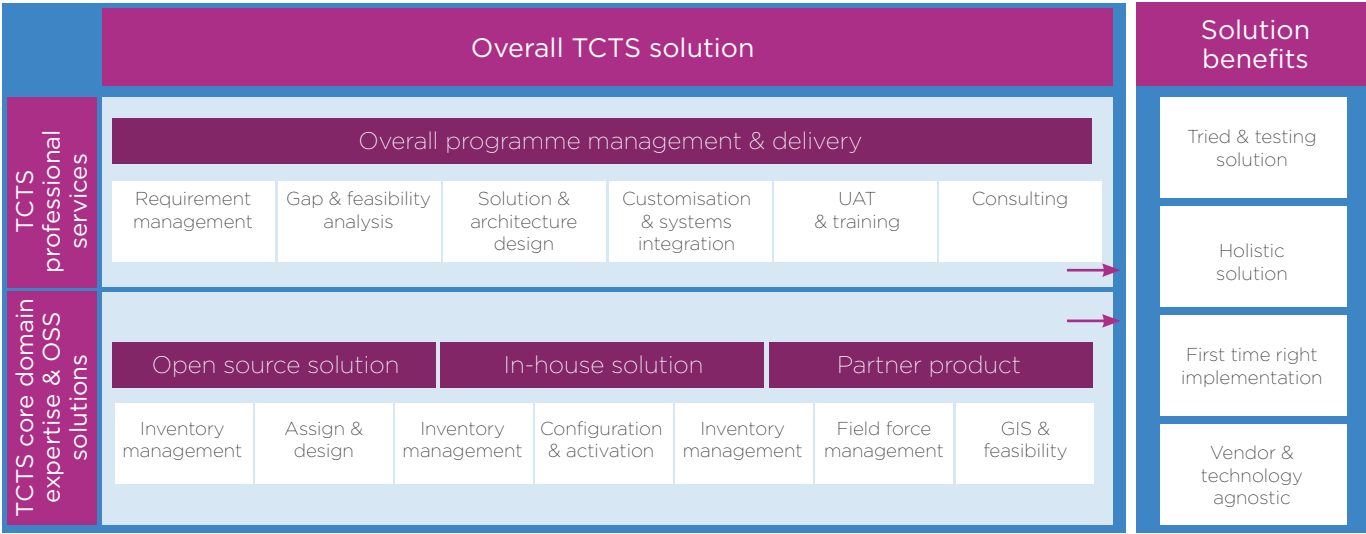
FIELD FORCE AUTOMATION

TCTS field force automation bridges the gap between an operator’s service desk and field operations by capturing field information in real time. The end user data is captured on a hand-held device and immediately transferred to the server through wireless connectivity (Wi-Fi, 2G/3G/4G). This instant capture reduces time-delays, manual data entry errors and improves overall field force efficiency. TCTS’s Integrated Field Force Management (IFFM) solution maintains information integrity, establishes a seamless communication between field staff and service desk to drive operational synergy, efficiency, and drive cost optimisation during service operations with enhanced service quality.

IFFM is a web-based desktop client for the service desk and a mobile application for the field workforce that uses both wireless and wireline operations with customised modules for daily patrolling, preventive maintenance, corrective maintenance and any unplanned activities to be scheduled. It helps in smart utilisation and re-allocation of field resources by capturing resource efficiency and saving operational expenses.

TOOLS & PLATFORMS

TCTS offers the most advanced tried-and-tested tools and automation solutions throughout the telecom lifecycle. TCTS transformation solutions provide agility and optimise business processes across inventory management, service fulfilment and service assurance, analytics and reporting, lab management, testing automation, and business-led solutions to assist CSPs in their transformation journey to a digital service provider.



ACCELERATE REVENUES THROUGH RAPID LAUNCH OF NEW AGE DIGITAL SERVICES – INNOVATE

Telcos need to adopt new business models offering network infrastructure to business enablement to consumer centric digital services to improve their margins and expect growth in the next decade. This will enable telcos to accelerate revenues opportunities and equip them to meet customer demands. TCTS helps telcos in accelerating revenue and improving profit margins by assisting in new digital services launch, monetising IoT, offering video-on-demand services, cloud services, SD-WAN, UCC and managed security services.

INTERNET OF THINGS (IOT)

With India's largest IoT network being managed by TCTS, we are presently building a real-world platform for IoT solutions to compete and collaborate. TCTS is an END-TO-END ORCHESTRATOR helping Tata group companies across various industry verticals to identify and deploy best-in-class IoT solutions by acting as an integrator of all elements of the IoT value chain. As an end-to-end system integrator, TCTS' approach is very modular and verticalised to suit specific industry needs.

TCTS' centralised global performance monitoring centre enables preventive actions to reduce service impact to end customers by pro-actively detecting and analysing abnormal indicators.

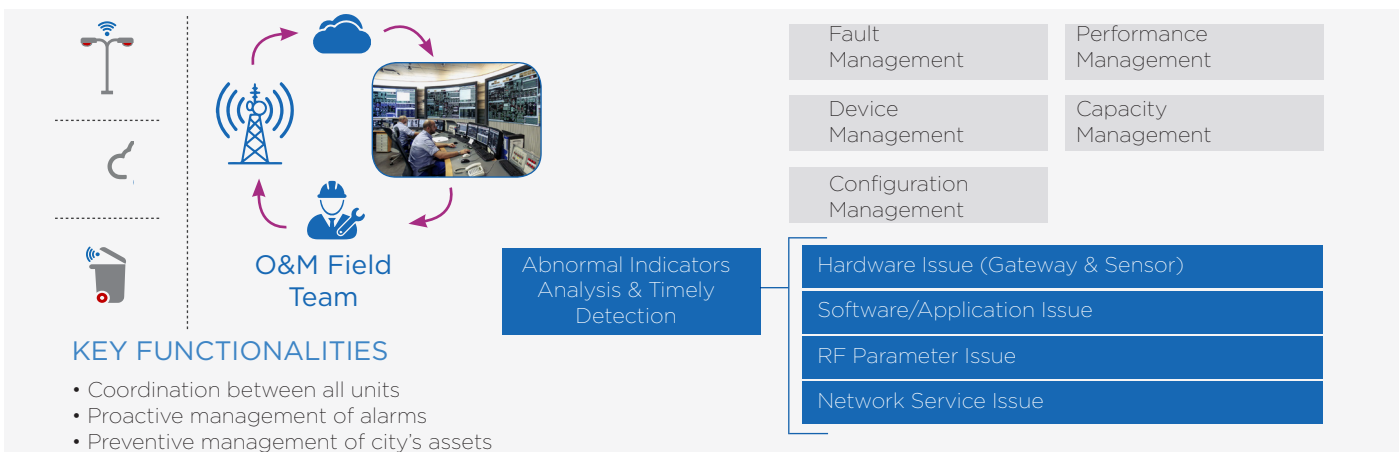
Building an IoT Network <ul style="list-style-type: none"> TCTS can help select the right access technology basis OBC's infrastructure Plan, Build and Maintain the network 	Software Elements & Vertical Use Case <ul style="list-style-type: none"> Platform identification, deployment & integration with existing infrastructure Develop end-to-end use cases (sensors, applications, additional s/w modules) 	Command & Control centre: Operations & Maintenance <ul style="list-style-type: none"> Build and run a management centre controlling all elements of the IoT system Critical support in managing SLA/KPIs 	Consulting and Business Enablement <ul style="list-style-type: none"> Market insights and lay down the GTM strategy and implementation roadmap Enable sales and delivery in a revenue sharing model

SMART CITIES

Connected devices are dominating the urban landscape. The fourth Industrial Revolution is combining the power of data with the power of the people. Technologies to leverage these devices, such as artificial intelligence, the Internet of Things (IoT), 5G, security, quantum computing and Blockchain, are unleashing numerous opportunities. But they are also posing new challenges, as citizens are increasingly concerned by privacy issues.

INTEGRATED COMMAND AND CONTROL CENTER

The Command and Control Center acts as the nerve centre for the whole smart city operations.



AUTOMATED METERING WASTE MANAGEMENT INTELLIGENT TRAFFIC MANAGEMENT SYSTEM	ENVIRONMENT MONITORING WOMEN SAFETY SMART PARKING	SMART LIGHTING SMART BUTTON SOLUTION CITY SURVEILLANCE
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CLOUD

Tata Communications Transformation Services' (TCTS) Cloud Networking and Security as a Service (SECaaS) offering, along with the virtual cloud connect platform, addresses the security and connectivity challenges faced by the enterprises across public clouds, private data centres and other interconnected ecosystems, bringing the benefits of automation, accessibility, security and improved synergies.

Cloud Networking and SECaaS is a fully software-defined platform running on a generic network functions virtualisation (NFV) infrastructure and hosting multiple virtual network functions (VNFs) to protect enterprise networks against external threats, attacks and data loss. This platform is an innovative take on an in-depth, multi-layer defence strategy for enhanced cybersecurity and connectivity.

Built on generic NFV infrastructure, the TCTS' Cloud Networking and SECaaS offering consists of virtual Firewall (vFW), universal CPE (uCPEs) and SDN access boxes. Users can manage the solution through zero-touch automation portal orchestrated by a Lifecycle Service Orchestrator (LSO). The solution works cohesively with SDWAN, creating a powerful combo of SDWAN, security and cloud access. It coexists with the TCTS' Virtual Cloud Exchange (VCX) solution that CSPs use to connect seamlessly with major public cloud providers.

SD-WAN DEPLOYMENT

TCTS assists telcos in building, deploying and managing SD-WAN including, zero touch provisioning, managing enhanced security of the platform, and application routing.

UNIFIED COMMUNICATIONS & COLLABORATION

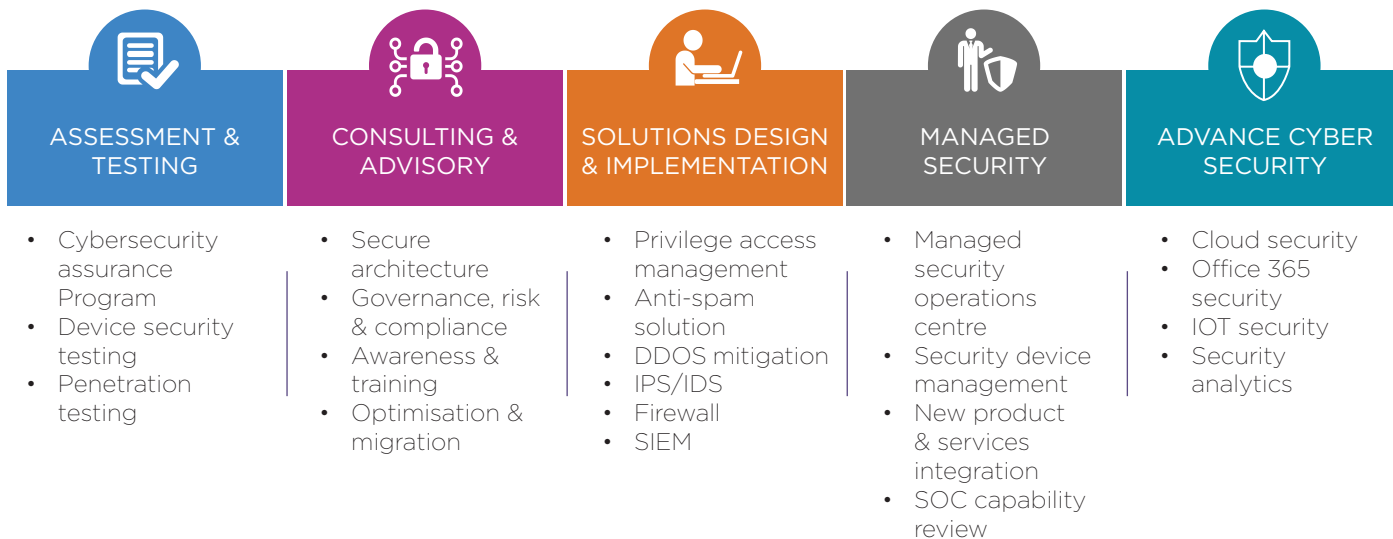
TCTS offers one-stop services & solutions for complete UCC and HCS product portfolio with vendor agnostic approach, coupled with strong partner eco-system to address the needs of our customers across geographies. Our experience in enterprise voice, collaboration, AV conferencing & contact centre segments covers wider spectrum of products ranging from TDM Legacy EPABX, Managed PBX, IP Telephony, converged voice solution and hosted collaboration service.

Our best-in-class technical consultants with a combination of skills in various products, specifically in unified communication & hosted collaboration and proven process expertise are the key enablers for clients to choose TCTS as their strategic partners. Our professional and managed services offerings on various platforms like Microsoft UC (SFB, O365, Teams), Cisco UC (UCM, HCS, UCCX/E, PCCE, HCS CC), Avaya UC (IP Office, Aura, Blue), etc. makes us UCC platform-agnostic in nature thereby rendering end-to-end services to our customers with various engagement models.

MANAGED SECURITY SERVICES

Tata Communications Transformation Services (TCTS) enables communication service providers (CSPs) to safeguard business assets, reduce operational costs and to meet compliance requirements with regulatory requirements by strengthening their security infrastructure using performance-based metrics.

TCTS also helps organisations with secure digital transformation for their advanced technology needs like cloud & IOT. TCTS understands the challenges and helps organisations to maintain the security and compliance around it.



About Tata Communications Transformation Services (TCTS)

Tata Communications Transformation Services (TCTS), a 100% subsidiary of Tata Communications Ltd, provides leading business transformation, managed network operations, network outsourcing and consultancy services to telecommunication companies around the world. TCTS delivers operational efficiency, cost transformation and revenue acceleration solutions for all the stages of the carrier process lifecycle including but not limited to network engineering and design, implementation and operations functions.

TCTS is a part of the USD \$100+ billion Tata group. Tata group comprises of over 100 operating companies in seven business sectors. TCTS leverages the market expertise of Tata group's global telecom operation capabilities and globally established IT, process and consulting skills. It carries the rich traditions and business ethics of the Tata companies.

For more details on TCTS and how we can help your company build, operate and transform, please contact us at tcts.marketing@tatacommunications.com or visit www.tatacommunications-ts.com. To hear more from TCTS experts, join us on LinkedIn <https://www.linkedin.com/company/tata-communications-transformation-services> and follow us on Twitter https://twitter.com/Tata_TCTSL.

