

# POWERING HIGH-SPEED BROADBAND WITH NEXT GENERATION FTTx

In today's telecommunication scenario almost all telecom service providers have a plan to provide high speed broadband and quad play services to their subscribers. Quad play consists of Data, Voice, Video and IPTV services. Now comes FTTx (the abbreviated form of Fibre to the x), the next generation broadband technology that provides a high-speed access to subscribers for different type of quad play services.

Broadly, Tata Communications Transformation Services (TCTS) delivers end-to-end services for FTTx including:

- Network Planning, Design and Engineering
- Network Roll out and
- Network management

Let's look at each of the components that go into delivering FTTx services

## 1. FTTx Network Planning, Engineering and Design

TCTS has operational experience in handling network engineering, planning and designing for Core network of global telecom operators. TCTS is currently providing these services to multiple large telcos through a skilled team of highly experienced professionals. The team uses industry best practices and Continuous Improvement Plans to deliver services within agreed KPI/SLAs while ensuring highest quality standards.

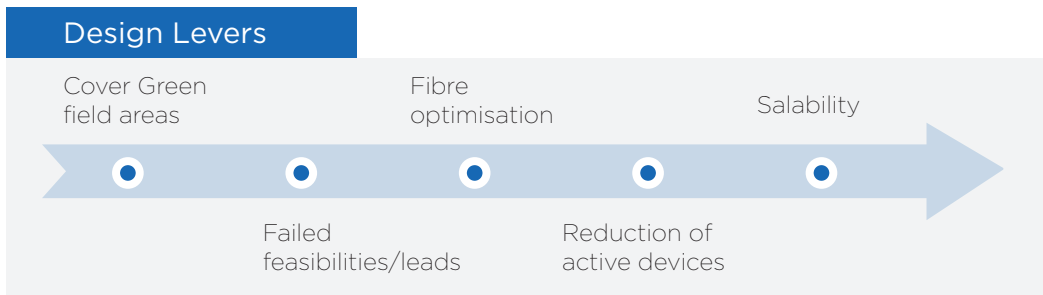
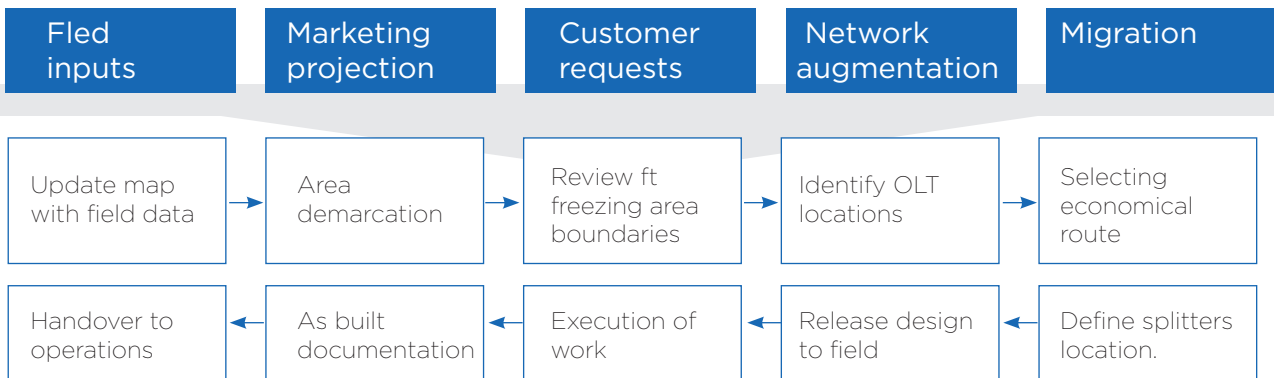
	Key activities	TCTS experience
Planning & design	<ul style="list-style-type: none"> <li>• Planning FTTx architecture (core &amp; access)</li> <li>• Design FTTx network</li> </ul>	<ul style="list-style-type: none"> <li>• Plan port capacity for FTTx</li> <li>• Design IP, VLAN, spanning tree for prepaid, postpaid, static / dynamic customers etc.</li> </ul>
Implementation	<ul style="list-style-type: none"> <li>• Multiservice platform</li> <li>• Network configuration (switch and routers)</li> </ul>	<ul style="list-style-type: none"> <li>• Configuration as per design</li> <li>• Develop configuration for switches and IP/ MPLS routers</li> <li>• Push configuration onto devices</li> </ul>
Integration	<ul style="list-style-type: none"> <li>• Integrate FTTx with network</li> </ul>	<ul style="list-style-type: none"> <li>• Integrating network with billing, LDAP, NMS, etc. along with distribution and IP core</li> </ul>
Validation & testing	<ul style="list-style-type: none"> <li>• Service validation (end-customer service)</li> <li>• Network validation (equipment or transmission)</li> </ul>	<ul style="list-style-type: none"> <li>• Integrating network with billing, LDAP, NMS, etc. along with distribution and IP core</li> </ul>
Firmware upgrade	<ul style="list-style-type: none"> <li>• Single node upgrade or bulk upgrade</li> </ul>	<ul style="list-style-type: none"> <li>• Pre &amp; post migration testing</li> <li>• Remote up-gradation</li> <li>• Up-grades carried out through EMS</li> </ul>
Network & customer migration	<ul style="list-style-type: none"> <li>• Physical shifting or technology upgrades</li> <li>• Customer migration</li> </ul>	<ul style="list-style-type: none"> <li>• Node setup on the new location</li> <li>• Migration of customer ports</li> </ul>
Record/ inventory updation	<ul style="list-style-type: none"> <li>• Monitoring and updation of inventory in IMS</li> </ul>	<ul style="list-style-type: none"> <li>• Updation of equipment details in metasolv and cramer</li> </ul>

The sub-activities under Network Planning and Engineering are described below:

### a. Network Planning and Engineering

The Planning team focusses on managing complexity across multiple teams, vendor neutral network agnostic and planning for First Time Right delivery of network. The key deliverables of this team include:

- Feasibility check, preparation of link budget and business case validation
- Evaluation of technologies
- Planning for equipment and bandwidth
- Analysis of requirement, new site rollout or expansion request
- Route survey and finalization, obtaining financial concurrence
- Placement of material request with material and logistic department
- Coordinate with contractor and field engineer for Quality Assurance and Acceptance Testing
- Management of drawings like single line diagram, As built diagram, Termination details, Site diagram, civil engineering drawings
- Creation of GIS or AutoCAD drawing
- Project planning, provides overall project time lines, plan, procure, coordinate & provide all inputs on time, load and monitor the project progress
- Obtain signoff on documentation from operations

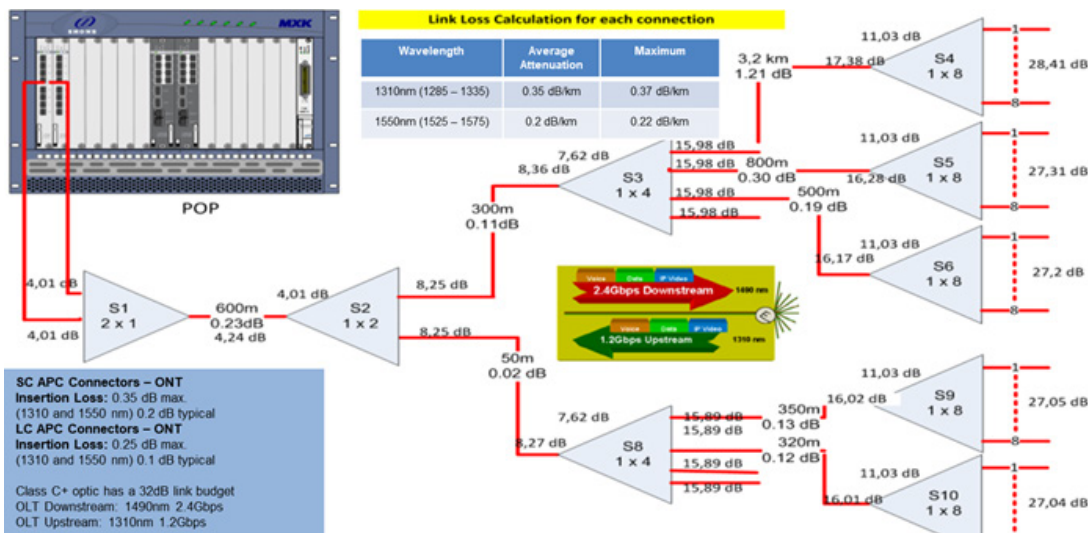


**b. Network Design**

The Network Planning and Design function supports service providers with high-level design (HLD) and low-level design (LLD) documentation. The design can be for network rollouts including core, customer access, edge and other complex orders. This function works closely with internal and external stakeholders to come up with the best fit and right sized network design for implementation.

The primary task for this Network design team is to issue the network design document for core or complex customer network order. This team works closely with different engineering teams and project management to create and issue the network design for implementation. The key scope of work includes:

- Study of existing network and feasibility report and network constraints
- Coordination with operations and field force to validate the site parameters, ensure availability of desired rack space and power.
- Creation of first design document which include requirements analysis, feasibility analysis functional or black box specification, options analysis, system architecture, implementation plan, training and cutover plan
- Creation of final design document which includes physical and logical network designs
- Final implementation schedule
- Update inventory management with new design
- Support to implementation team at the time of commissioning
- Verification of implementation of correct design or update inventory in case of any alteration



## 2. FTTx Network Roll-Out

It is very important that the network design is installed on ground systematically within defined assets and provide services to customers as expected.

Below are high level functions during network rollout delivered by TCTS

- Project Management - this involves end to end project management which helps to rollout of network as per schedule with required specifications. During rollout it requires a good coordination among different functions in field operations to avoid repetitive tasks within given resources and with an optimized cost and time.

Some of the functions of TCTS project managers are listed below -

- Coordination between multiple functions
  - Monitoring available resources and their utilisation
  - Track project time lines
  - Scheduling multiple tasks to avoid repetition and delays
- 
- Network rollout in field - This includes physical installation of assets as per design and completing activities like digging and laying of conduits, pipes, joints, man holes, etc. This involves installation of active network elements and nodes in field. There are multiple type of nodes such as Ethernet and IP, transmission, other technologies like xDSL, GPoN and Wifi.
  - As-Built Update - Once a network is installed in field, it is verified that it is installed as per design. If there are any deviations, then those are noted, validated by design team and then updated in GIS inventory system. This helps to prevent any anomalies during feasibility and activation of customer services and reduces time to connect for any new connection. All such documents and as-built are stored on share point for future reference.
  - Acceptance testing - Before commissioning services on installed network, the network is tested thoroughly and fine-tuned with specific requirement of the operator. TCTS uses various templates which makes easy for acceptance of the network. During this intense testing, network is tested for normal working and it is seen that standard configurations are applied on network components.
  - Material management - Delivering required material at work site is a crucial step towards adhering work schedule and reducing project cost. TCTS project managers monitor material deliveries and align the movement of material on the specific sites and locations as per schedule.
  - Quality monitoring - Quality of installed network is a crucial aspect, as this have a long term and deep impact on network performance and hence on customer satisfaction. So it is obvious that good network will have able quality managers who regularly inspects various quality aspects for material used, implementation methods and standards, configuration checks, performance parameters etc. TCTS have a pool of quality managers who will check each and every aspect of network deployed for good performance of network once services are live on that network.

## 3. FTTx Network Management

TCTS have skills to manage very complex networks and improve customer satisfaction with its customer centric approach.

TCST can manage multiple domains and technologies in a today's telecom scenario.

When it goes to FTTx networks, this involves multiple technologies like Ethernet and IP, transmission and xDSL or GPON equipment connecting to each other.

TCTS with its multilayered NOC approach is able to manage different technologies and many vendors from a single NOC. TCTS is a vendor agnostic organisation and have expertise on legacy as well as next gen equipment.

TCTS assurance framework have different layers given below.

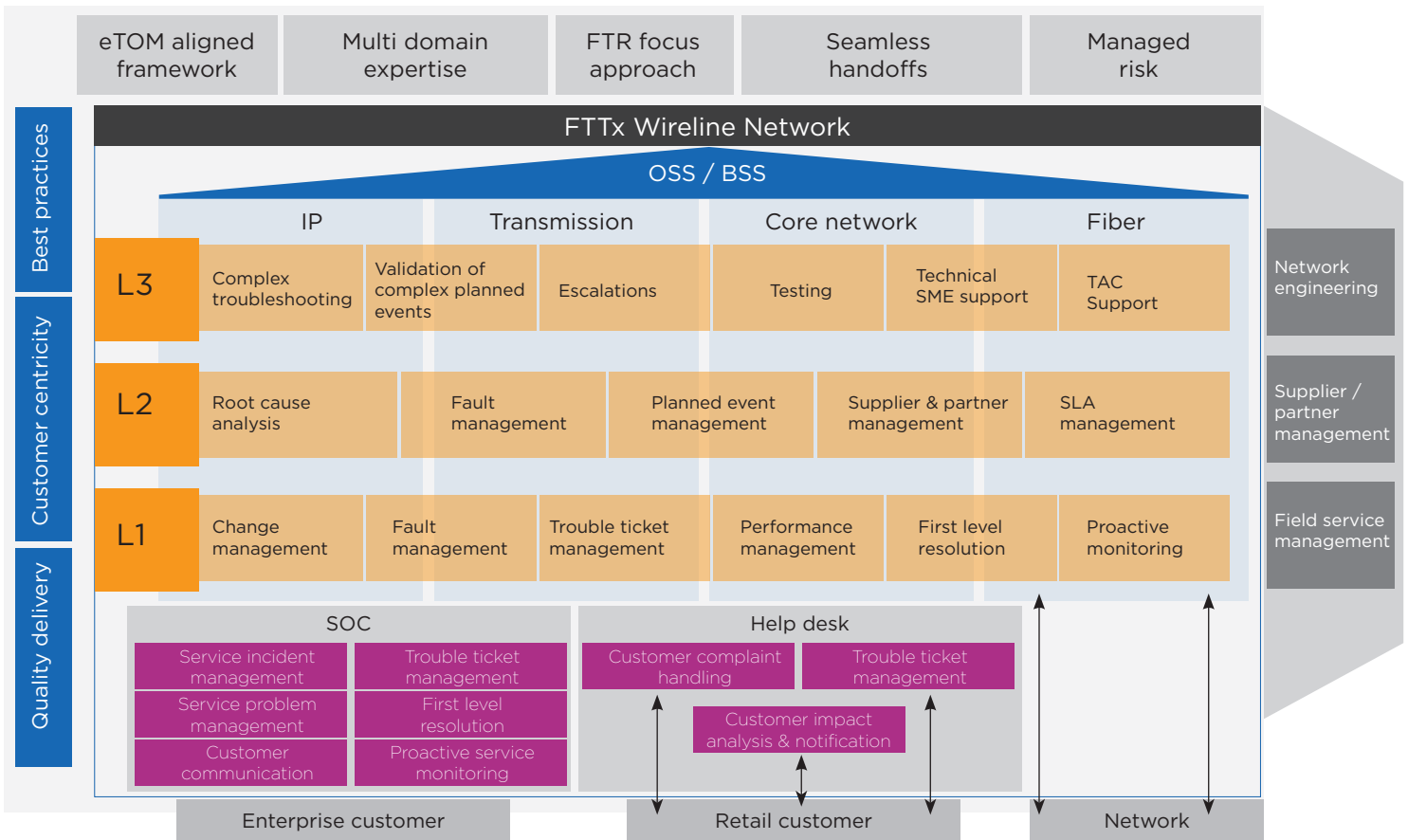
- Helpdesk
- Service operations center(SOC)
- L1 network operations center
- L2 and L23 network operations center

This layered architecture helps to categories every activity in NOC with specific focus.

A list of activities in NOC is given below –

- Network Monitoring – Reactive and proactive
- Fault management
- Inventory management
- Configuration management
- Complex troubleshooting
- Trouble ticket management
- Network performance management
- Service activations and provisioning
- OEM coordination
- Vendor and third party communication
- Data security management

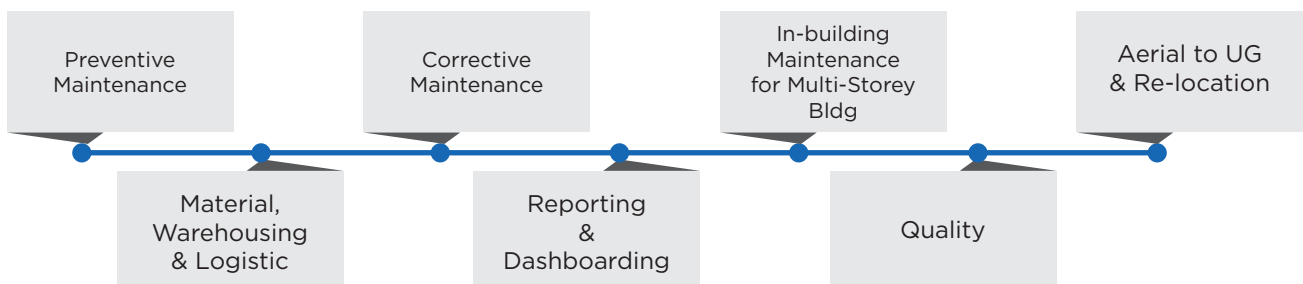
**Indicative Network Diagram**



**a. Fiber Field Maintenance**

The Field Operation capabilities includes the responsibility for the day-to-day operation and maintenance of the network elements, fibre plant and associated infrastructure. It also includes responsibility to support new network roll out and infrastructure management. Field service team works closely with NOC for fault resolution and to deliver preventive maintenance of equipment. The Field Operation team is available 24x7x365 to ensure high network uptime and quality service to customers.

Below table highlights the key areas for Fibre Maintenance but not limited to:



## b. Equipment Field Maintenance

Equipment maintenance includes routine maintenance and fault locating. Routine maintenance conducted by the network management system involves network access domain and function access domain management, unified equipment management, flexible resource management, monitoring of performance statistics, and remote version upgrade. An intelligent system is also provided for optical power monitoring, ODN fault pre-warning, fault diagnosis, and remote fault recovery.

FTTx service solution that allows interconnection among the service system, GPON network management system, and fault handling system. When incorporated into an end-to-end O&M procedure, the FTTx service system handles FTTx faults.

GPON has aroused the interest of leading operators for its high bandwidth and high split ratio. As GPON networks are being deployed around the world, operation and maintenance has become the focus of attention. Today, market competition tends to be customer centred. FTTx services offered by operators are similar in nature. So TCTS complete FTTx O&M solution encompassing equipment commissioning, service provision, equipment maintenance, and fault locating will gain a competitive advantage in the marketplace.

Though majority of the Network Operations activities are carried out centrally through the NOC, certain activities are required to be carried out at Field level. These include activities such as Corrective Maintenance, Preventive Maintenance, Service delivery related activities, regulatory/EMF related activities etc.

TCTS Field services management offering is designed to optimize the number of field resources required in a given coverage area by leveraging the most efficient workforce management tools, highly skilled resources and proven and efficient processes to improve the response time and delivery intervals to help our customers keep themselves ahead of the competition.

Customer network is planned to be managed through field teams in regions. TCTS proposes to have an Integrated regional field force headed by Field operation lead in Central Facilities responsible for efficient operations and maintenance of all network segments under the scope of TCTS while ensuring SLA and KPI s are achieved as per the defined target given by customer.

### Preventive Maintenance

TCTS Preventive Maintenance methodology, focuses on implementing inspections, performance tests, spare part replacements, software updates in case of active equipment to enable, early detection and correction of potential failures, either before they occur or before they develop into major defects and avoids business/revenue impacting downtime and high repair bills.

The typical approach for Preventive maintenance (PM) is done in accordance to the maintenance manuals of network element. TCTS shall support PM activities under the guidelines of maintenance manuals. For any service impacting / service threatening preventive maintenance activity, TCTS follows planned event management process which includes approvals from relevant stakeholders. This service will be undertaken at a regular interval as defined for each network element separately.

### Corrective Maintenance

TCTS Corrective Maintenance methodology, focuses on appropriate distribution / placement of field operations resources to ensure that the timelines for response and resolution are in line with the SLAs/KPIs and focus on first time right methodology. Additionally, TCTS plans to multi-skill the organization at the field level unlike the traditional model of dedicated skillset oriented resources focusing on specific technologies/domain.

The corrective maintenance methodology in TCTS reflects ownership and responsibility which is deeply engrained into all our field engineers. The key elements of this are as follows:

- Intelligent 360° approach for resolving faults: In addition to the assigned fault, potential faults are addressed to avoid faults and revisits.
- First time right resolution to trouble tickets: Deputation of right skilled resources suitable for resolution of faults with relevant car kits, spares required for event handling along with compliance to prevalent HSE policies.
- Strong focus on test and measurement tools duly calibrated on regular timelines.
- End to End ownership of the trouble ticket till they are closed post confirmation by customer NOC and TCTS Service desk

In addition, TCTS field teams shall collaborate with Service Quality Management team for improving network uptime and reducing the potential trouble tickets by implementing corrective improvement plans mutually agreed with the customer.

TCTS will provide support for Corrective Maintenance. The typical approach for Corrective maintenance (CM) is done in accordance to the specified information from the trouble ticket, network element category and fault category and service level.

## 4. Tools and Applications

TCTS have hands on expertise to work on various GIS tools used in multiple telecom operators across globe. TCTS have worked on below GIS tools -

- Small world
- Spatial net
- Map Info
- Arcnet
- Telecordia
- AutoCad

Working experience on these various tools makes TCTS unique among managed service partners.

Small world			
ERDAS    GeoMedia			
Auto Cad	OPTINT (Auto Cad customised toll)	Micro station	IRASB (Raster image viewer)
Geo/Technology	Network access	Image/FRAMME	

### About Tata Communications Transformation Services (TCTS)

Tata Communications Transformation Services Limited (TCTS), a 100% subsidiary of Tata Communications Ltd, provides leading business transformation, managed network operations, network outsourcing and consultancy services to telecom 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.

