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The Merger of Two Giants
How TCTS Made it Happen

Two of India's leading telecom operators underwent a merger. To the public, it looked like a smooth, seamless process that happened overnight but under the surface it was a different story.

While both companies were providers of Voice and Data services across 2G, 3G and 4G platforms pan-India, the two entities had evolved and grown in individual and distinct capacities. With a formidable customer base each, and two very different modes of operating, the merger involving over 350K consumers was going to require a lot more than signing a few documents and a handshake.

The Task at Hand:

Network Consolidation
The networks of both entities had to be consolidated so that the collective customer base could be serviced as one. This involved the integration of ~20K devices and nodes including Transmission (Access and Core) IP/ MPLS Routers (Pre-Agg, Agg and Core Routes) and NPT (MPLS-TP).

Optimisation
Removal of redundancies due to merger to build a unified optimised network.

ZERO Service Outage on Live Network
The entire process had to be carried out on a live network with no service outages so as to not inconvenience customers in any way.

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The Challenge

The focus needed to be on:

Transforming the Access Layer Network from the Optics Layer to IP Layer (referred to as IPfication), making all the switching layers IP driven and limiting the transport to fat-pipe interconnects.

Transitioning the Synchronous Digital Hierarchy/ Time-Division Multiplexing technology layer to Packet Transport Networks layer.

Unifying the Autonomous System (AS) Numbers of the two networks.

Simplifying the IP layers.

However, complexities were involved as the two entities had independently evolved and grown their respective networks. Some of these areas included:

- Operational Support System Tools
- Business Support System Tools
- Database Management
- Processes

Legacy technology and equipment are a natural subset of an evolving network. As the two entities were independently evolved large networks, it posed multiple other challenges:

Network Inventory Visibility:

Increasing customer base and technology changes over the years posed challenges to keep track of the growing equipment base and fiber layer network (aerial and underground). The challenges also extend to different layers of technology in Optics and Transmission & IP-MPLS Layers. The presence of multiple OEMs resulted in additional complexity.

Network Capacity Inventory:

One of the key aspects in network planning and operations is Network Capacity Planning and fractional distribution of the bandwidth to the service layer across services. One-time deployment has to be followed up by timely change management through an Inventory Management System across technology layers. Lack of systemic approach in optics layer led to inconsistencies in the IP layer relating to the two operators. Network planning and operations needs to be an ongoing process in order to allow for scalability of the business.

Process and Guidelines:

Some of the challenges that arose from steadily changing landscape included asymmetric traffic trail mapping in the access rings and accumulation of inconsistent trails in the live network as well as in the Network Management System database. It was also observed that IP layer of the two network providers was inconsistent with one being on a private Autonomous System (AS), while the other was on a public AS. As the private AS used multiple switching layers and the public system used in-line Route Reflectors (RR), it was necessary to convert at least one of the AS in order to consolidate the two networks.

The Solution

The solution involved designing consolidated system as per the customer's requirements to cater to their business needs. The stages from planning, execution and delivering the end-stage design involved several steps including:

- Studying the existing state of optics network and identifying the gaps in the network and services with respect to desired end-state design.
- Developing an execution plan that would focus first on areas where no new inventory was required.
- Creating a high-level blueprint to achieve End-State Design.
- Designing a site-specific traffic migration plan at the network and service level.

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Approach and Execution

Mapping:

Mapping of all the systems was carried out using Geographic Information System tools to study the optics network and identify any gaps in the existing network and services. This included:

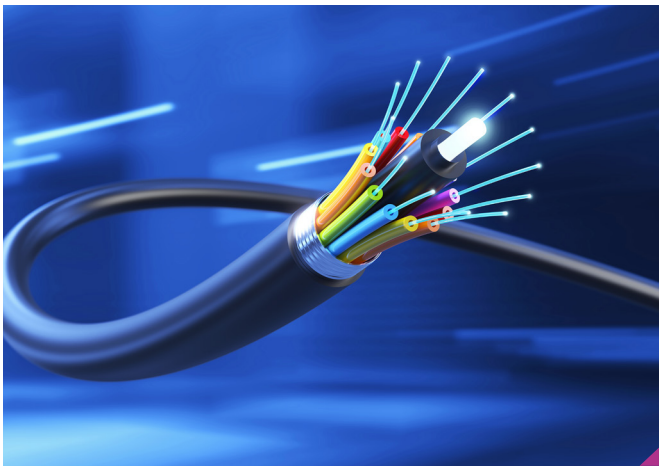
Superimposing the fiber infrastructure of both operators to analyse and split existing rings into smaller ones to build more capacity.

Mapping the electronics (both optics and IP) present in the NMS to existing fiber POPs.

On the basis of city/district level guidelines, additional fiber POPs were proposed with last mile fiber roll out.

High Level Blueprint:

The existing and end-state network were compared using a High Level Design for overall Base Transceiver Station, Point of Presence, and Electronics for both Optics and IP. The team then prepared topologies for Access, Pre-Aggregate, Aggregate and Core Rings, along with capacity. Metro and circle level dense wavelength-division multiplexing were designed with adequate redundancy mechanism for faster traffic convergence. The High level Design also covered a consolidated BoQ for the Optics and IP Layers, along with a redeployment plan.



Execution Plan:

An optimised execution plan was laid out prioritising areas with no additional inventory requirements, coupled with the availability of infrastructure like fiber layers. This resulted in freeing up of fiber inventory that could be reused in subsequent implementation phases.

Traffic Migration:

Dynamic Circuit Network and Sync Plan were used to prepare the Network Design Document for the individual network elements, which included:

- A service configuration template
- Maintenance Operation Protocol for each layer configuration (DWDM/ Optical Transport Networking / Packet Transport Networks / IP/ Mobile Location Protocols)
- Site specific service migration plan for each site
- Node specific action

A NOC worked in coordination with a field support team to ensure a smooth customer-centric change management process.

Engagement of Tools in the Solution Approach:

Two types of approaches were used during the consolidation process:

Commercial off-the-shelf (COTS) based, to discover the multi-vendor and multi-layer topologies of both the networks which, in turn, initiated planning and execution.

DevOps methodology wherein the user team, tools team and developers together identified pockets where automation could be carried out through localised scripts. For example, the MOP preparation for the IP layer was automated using scripts and RPA was used for service impact analysis.

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The Solution

The aim of the project was to combine two telecom networks through integration of their various layers (Access, Pre-Aggregate, Aggregate and Core), as well as designing the End-State Network as per the customer's requirements covering ~20K devices.

The project was completed using a systematic, well-planned approach resulting in:

- **A cost-effective integration:** Included inventory redeployment to the tune to 10% to 15%
- **Augmented Network capacity:** Through standardised network architecture enabling new business and customer acquisition
- **Enhanced customer experience:** Consolidation at the IP layer to reduce latency and improved QoS
- **Increased Network resilience and uptime** by eliminating single points of failure and shortening the network path
- **Fiber layer optimisation** leading to freeing up fiber layer inventory for use where required

The above approach brought the merger of two telecommunication networks while satisfying each of the customer's requirements. The integration process has not only improved and increased the speed of service for customers but has also streamlined backend processes through an Inventory Management System based approach across technology layers. It is also important to note here that this mammoth task was undertaken without any reported service outages.

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