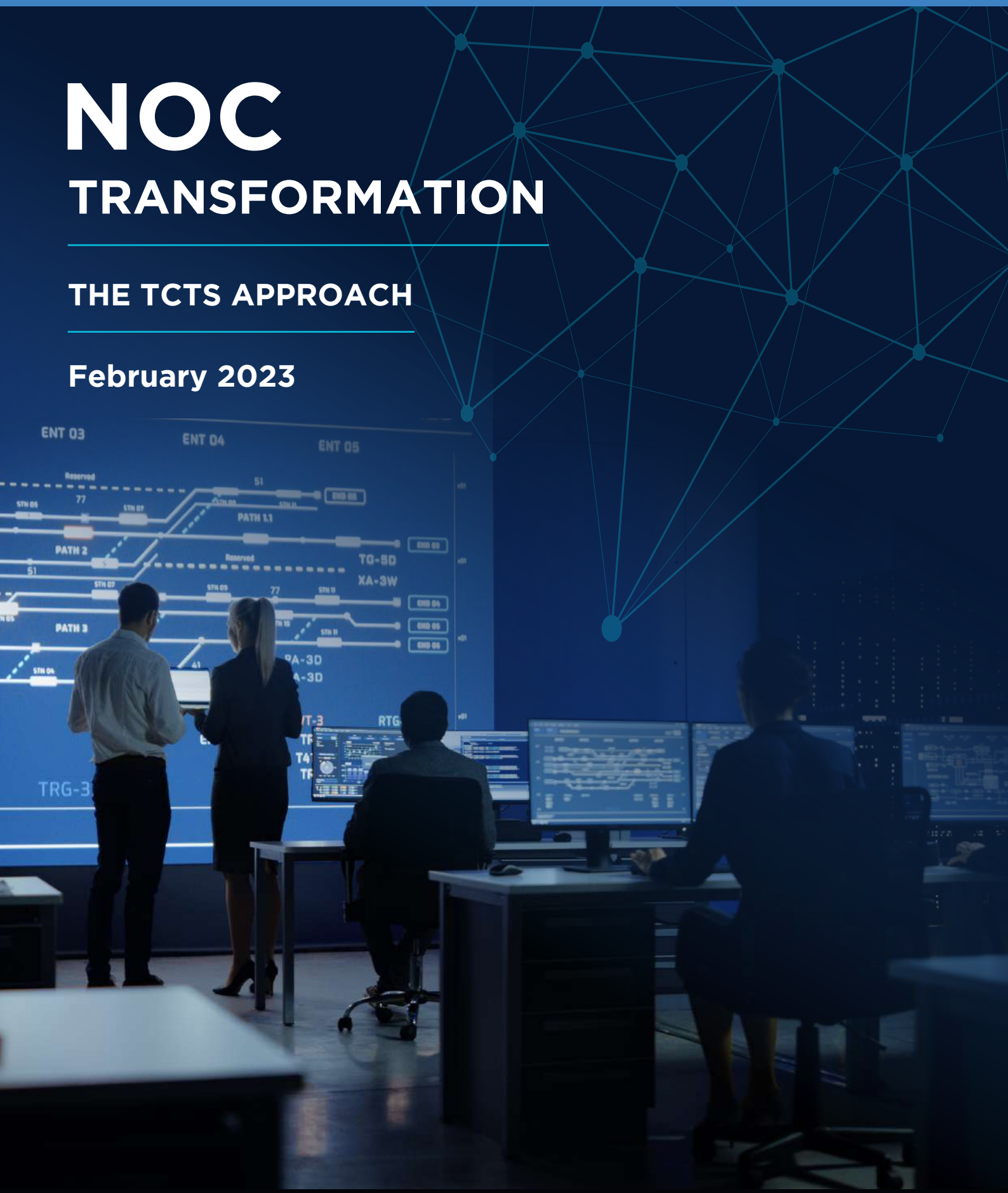
TATA COMMUNICATIONS
TRANSFORMATION SERVICES

NOC TRANSFORMATION

THE TCTS APPROACH

February 2023



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EXECUTIVE SUMMARY

Tata Communications Transformation Services (TCTS) has operated and transformed several Network Operation Centres (NOCs) across various technology domains, be it wireline or wireless. NOC transformation can be achieved by blending our deep domain knowledge with new technologies like AI/ML, digital and cloud. Identifying challenges, analysing root cause and leveraging new-age technologies is required to create solutions that can enable NOC transformations.

This report aims to share TCTS's experience of achieving NOC transformations with Communications Service Providers (CSPs). The report covers all implementation aspects, including case studies to guide CSPs in their transformation journey.

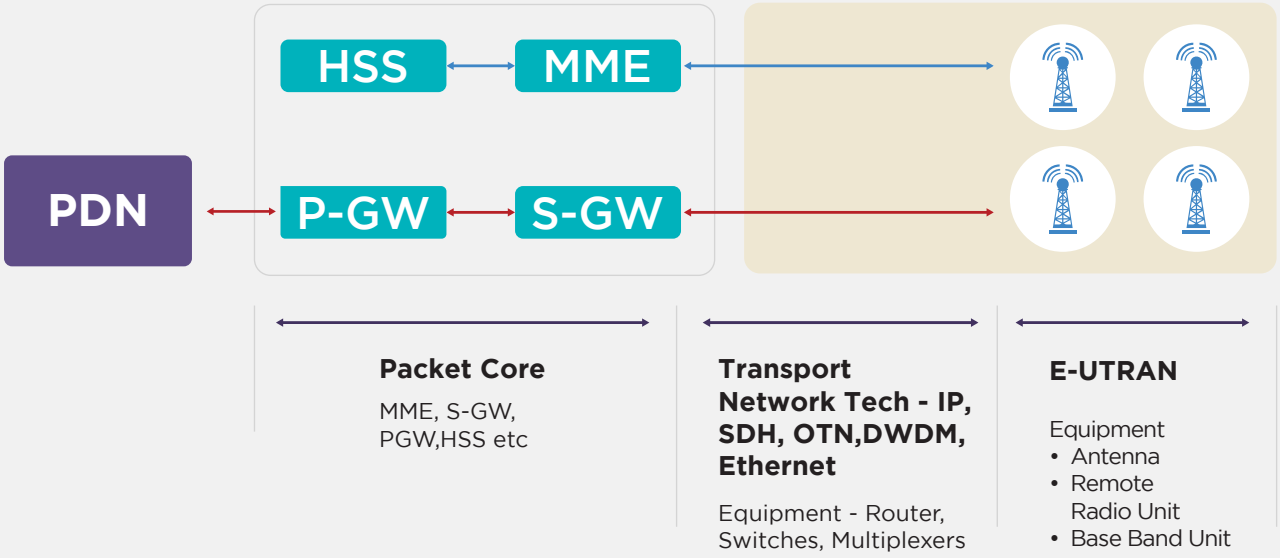
INTRODUCTION

In this report, TCTS intends to share its experience of operating and transforming several NOCs and supporting CSPs in their transformation journey. The report discusses the NOC challenges 'as-is' and proceeds to share TCTS' vision for NOCs, describing each stage of the journey along with its various stages.

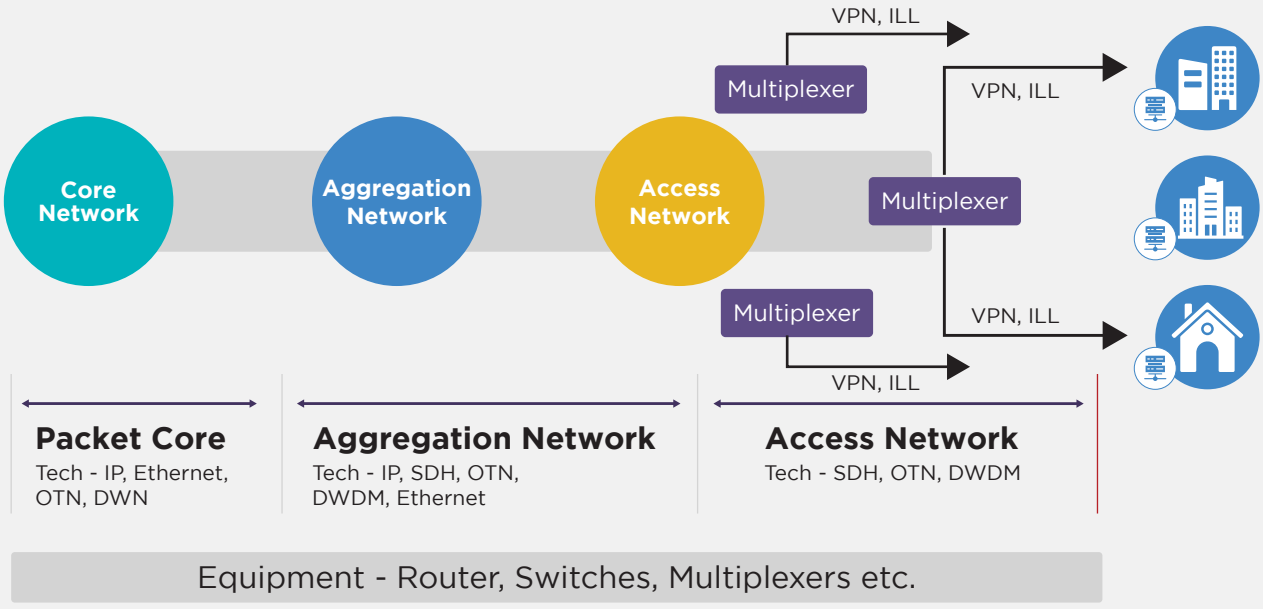
The report suggests various levers for transforming NOCs and how each can solve operational challenges. Each lever presented in the report leverages modern technology and TCTS' deep subject knowledge in the network domain. The suggestions are supported by case studies of successful transformations, emphasising the utility of levers.

AS-IS NOCS & CHALLENGES

Over the years, TCTS has implemented and operated NOCs for multiple Tier 1 CSPs across the globe, catering to different customer segments by leveraging various technologies, as explained through the examples presented below:



Mobility network catering to consumers,leveraging technologies such as 4G.



Wireline telco network catering to businesses (B2B), leveraging technologies such as IP, Ethernet, SDH, OTN/PTN, DWDM etc.

After multiple engagements with Tier1 CSPs, some of the key NOC Challenges and their Impact are presented below:

CHALLENGES

Adhoc change management

Changes done in the network to fix service issues may not reflect in the network inventory, leading to automation failure.

Inaccurate network inventory

Inaccurate network inventory across service assurance or fulfilment leads to automation failure.

High volume of alarms

The emergence of new use cases and high network size can lead to high volumes of alarms which is a challenge to address manually.

Unavailability of network and services impact

The emergence of new use cases and high network size can lead to high volumes of alarms which is a challenge to address manually.

Manual handoffs

Human effort is wasted in enabling work handover between NOC and field, despite the presence of tools like Workforce Management.

Manual troubleshooting

Manual NOC troubleshooting consumes a lot of human time and effort.

No predictive analytics

Most NOCs do not use predictive analytics that can enable proactive capabilities to initiate action before a fault occurs.

Inelastic operation

NOCs are unable to scale with the growing network, growing alarms and previously listed challenges.

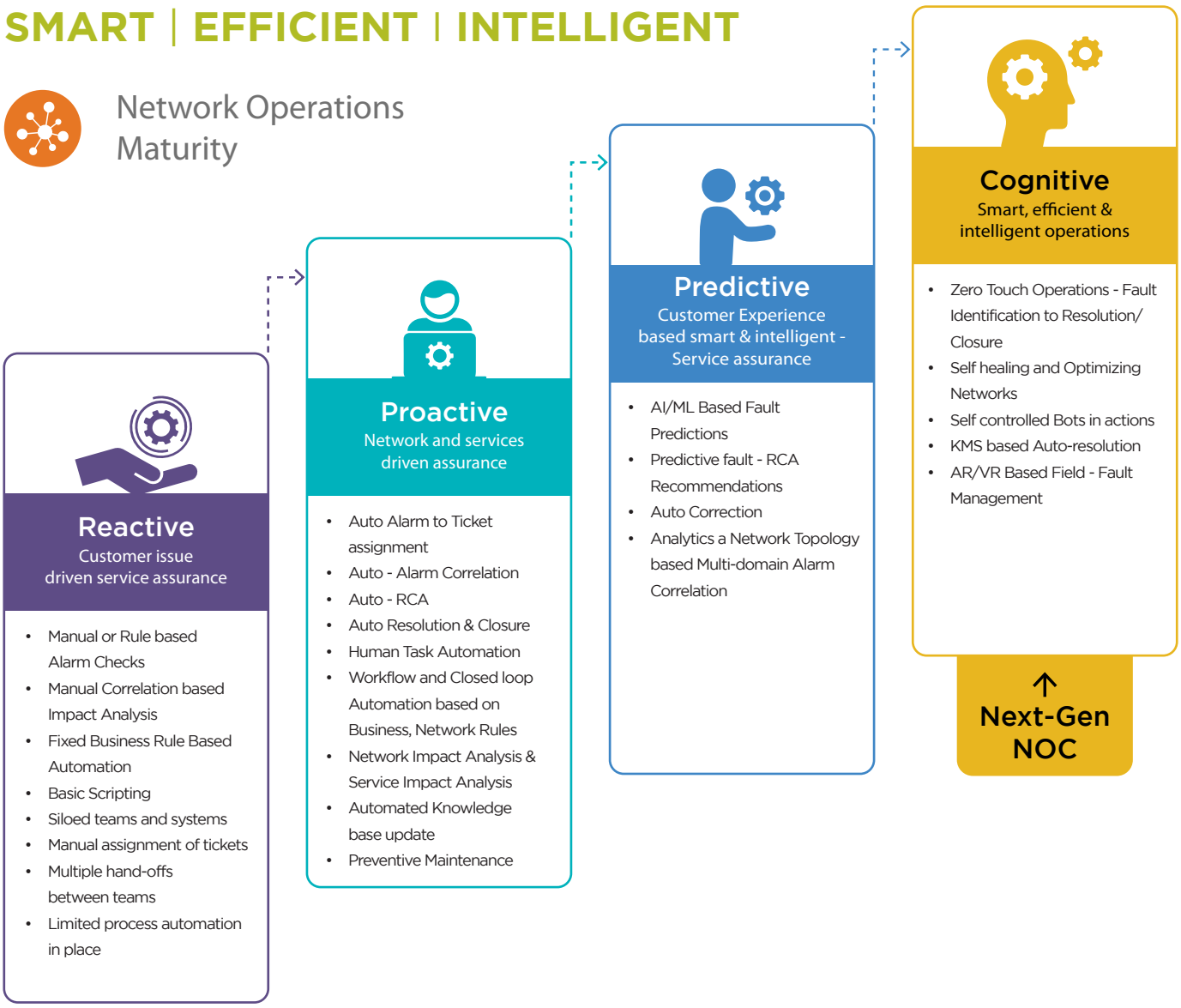
IMPACT

- High mean time to repair (MTTR)
- High network/service downtime
- Low operational efficiency
- Sub-par customer experience

TO-BE NOC - TCTS' VISION

TCTS envisages the NOC maturity journey through 4 successive stages - reactive, proactive, predictive and cognitive. While most operators are in stages 2 and 3, mature operators are moving to stage 4. TCTS intends to work with CSPs to help them accelerate their journey to NOC maturity

SMART | EFFICIENT | INTELLIGENT



TRANSFORMATION AND SUGGESTED LEVERS

TCTS proposes to transform CSP's NOC with the levers presented below, assuming that the CSPs have the usual OSS systems like Network Management System (NMS), Service Management Tool, Work Force Management Tool (for field) etc., already implemented.

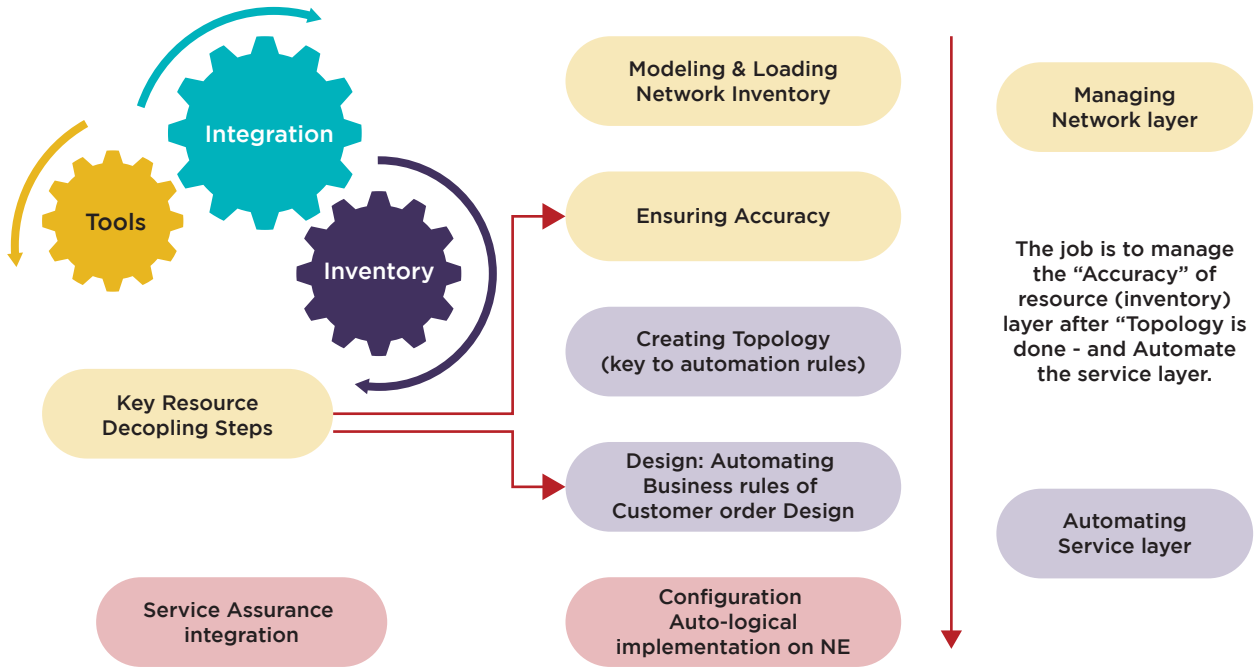
A depiction of challenges that relevant levers may solve is presented below

Lever 1	Adhoc change management
Lever 2	High volume of alarms
Lever 4	Manual handoffs
Lever 5	No predictive analytics
Lever 1	Inaccurate network inventory
Lever 2	Unavailability of network and services impact
Lever 2 + Lever 3	Manual troubleshooting
Lever 2 + Lever 3 + Lever 5	Unable to scale

LEVER 1: NETWORK INVENTORY INTEGRITY

Network inventory is a critical system, expected to be a replica of the network in a software form, and its accuracy builds the foundation for service layer automation. With 15+ years of experience, TCTS automates the service layer efficiently by managing and maintaining the inventory as the 'single source of truth.'

Given the variation in size, network complexities, etc., standard OSS packages are not enough to maintain inventory integrity. It is crucial to highlight that managing the network layer is key to service layer automation, and it can be managed through a combination of inventory, its integration with other OSS in the ecosystem, and bespoke tools.



Recommended steps to achieve network inventory integrity:

Integration of logical inventory systems with other OSS in the ecosystem. Network inventory discovery should be done at varying frequencies depending on different segments of the network. Each planned or unplanned change scenario should be analysed carefully, and inventory update automation designed and implemented accordingly

LEVER 2:
ALARM CORRELATION

In multi-technology, multi-OEM network environments, fault in one layer or segment can impact other segments, making alarm correlation crucial for NOC transformation.

TCTS suggests two approaches for Alarm Correlation:

Approach based on network topology & rules

Based on network topology & inventory data to correlate events and determine root causes.

- Historical network data is not required
- Guidelines & rules available from OEMs for event correlation
- Minimum efforts required to analyse correlated outputs
- (in case of single vendor stack)

Approach based on data analytics & AI/ML techniques

Based on historical and real-time event data to correlate events and provide RCA recommendations.

- Domain, technology, and vendor agnostic approach
- Self-learning system
- Minimal change management

While the choice of approach for a CSP depends on factors like network complexity, operational maturity, etc., building capabilities through the topology approach is recommended for at least a few domains. This creates a solid foundation to implement the multi-tech analytics/ML-based approach in future.

LEVER 3:
AUTO TROUBLESHOOTING & FAULT REPAIR

Traditional off-the-shelf Operations Support Systems often fail to perform under certain use cases, as highlighted below:

Automated troubleshooting

- Interface MTU check
- Network interface statistics
- Check start up config, running config

Automated fault repair

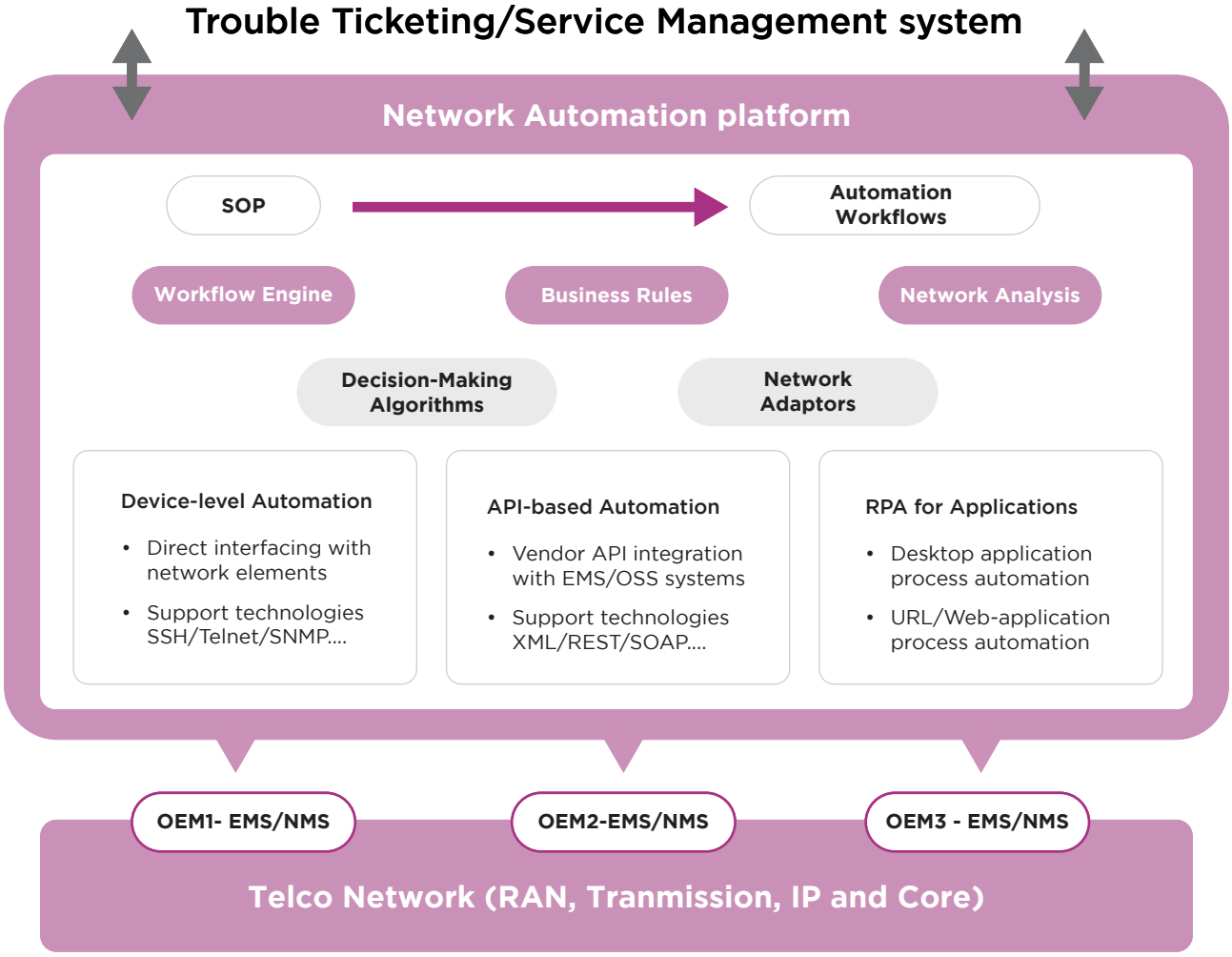
- Device parameter update such as power, frequency, etc.
- Device port / interface reset

Automated testing

- RFC2544 testing
- Voice quality testing
- BW (upload, download), ping, jitter testing

Generic network automation platforms (NAP) can support such use cases with the capability to interface with networks using various protocols such as SSH, REST APIs, and CORBA.

A NAP includes multiple components like Workflow engines, business rules, network analysis, decision-making algorithms, and network adaptors to get network information and invoke action. It converts the Standard Operating Procedure (SOP) into automation workflows consisting of a series of steps, with each workflow catering to a single automation use case (e.g., front-line troubleshooting for an IPVPN service, etc.).



NAP can provide multiple benefits to operators, including:

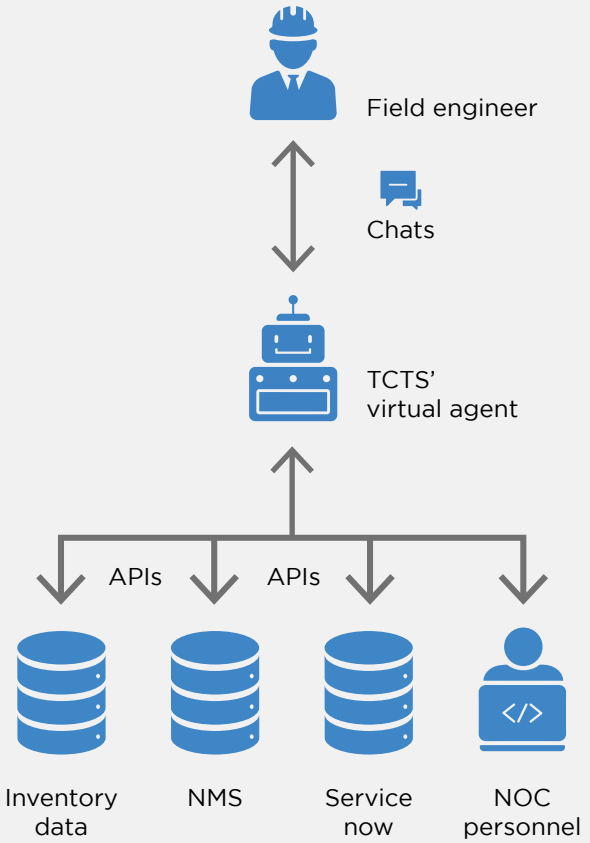
Upto 80% reduction in troubleshooting time

Significant reduction in MTTR

Improved customer experience

LEVER 4:
VIRTUAL AGENT

Virtual agents can handle most interactions between NOC and field teams, NOC and IRU partners, etc., over basic information sharing. Natural Language Processing (NLP) based contextual AI virtual agents, can help take the load off NOC. They are available 24/7, understand input queries and can serve the teams by providing relevant information from backend systems.

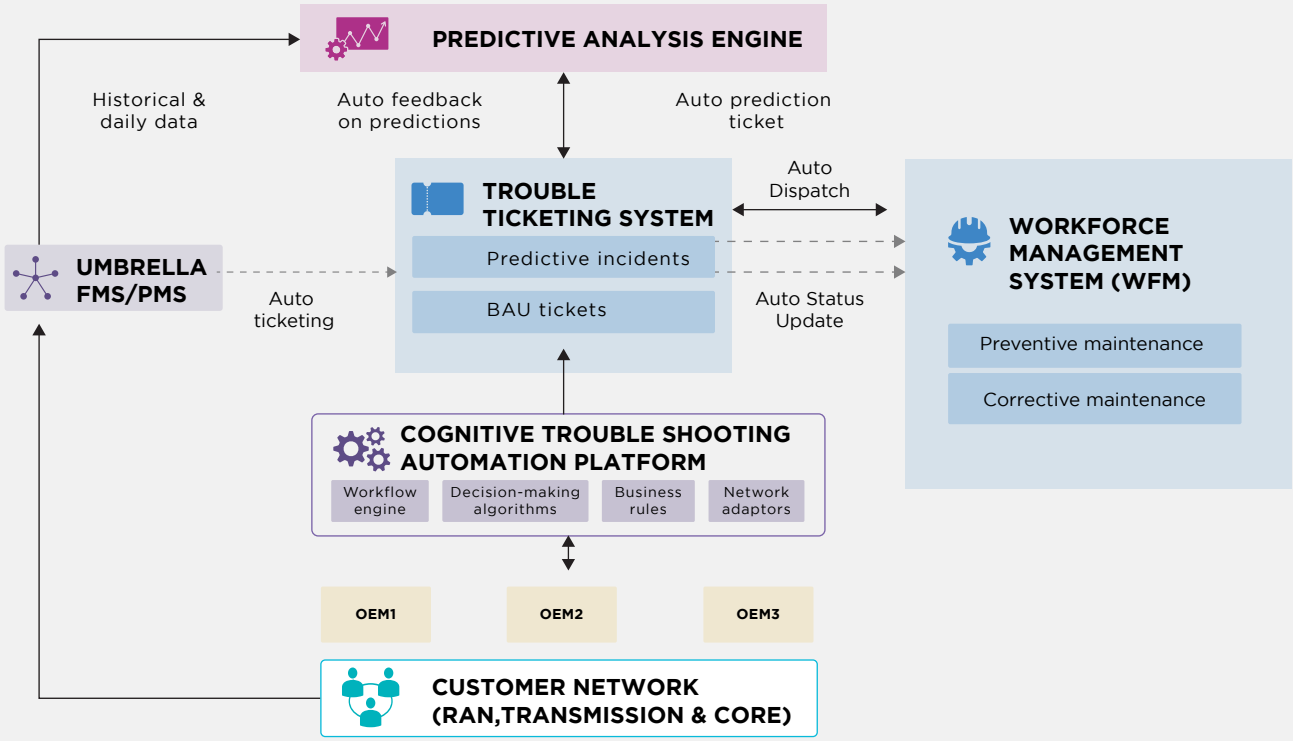


LEVER 5:
PREDICTIVE MAINTENANCE

TCTS has been developing and implementing predictive maintenance, leveraging predictive analytics for service/network assurance use cases since 2015. The maintenance includes:

Predictive analytics engine - To predict network fault 7 days in advance, giving operators adequate time and relevant recommendations to correct faults.
Cognitive troubleshooting engine - To repair faults

The approach



Use cases

ACTIVE NETWORK

- Hardware fault prediction for transport network
- Node unavailability or isolation
- Minimize truck rolls (optimize field visits)
- Minimize efforts on non-actionable alarms
- Predict, correlate, segregate alarms in the network

PASSIVE NETWORK

- Tower structure performance & maintainence requirements
- Improved seasonal readiness
- Predict fuel requirements or beat plans
- Power consumption analysis
- Temperature & fire risk analysis

The benefits

- Reactive trouble ticket reduction
- Proactive actions
- Alarm volume reduction
- Better customer experience and OPEX reduction

TCTS advantage

- Use case library with 100+ use cases linked to network
- Framework to integrate with telcos/ enterprises existing systems and tools
- Proven, scalable and extendible architecture for multi-technology, multi-vendor and multi-services network
- Best practices and frameworks for data management, analytics set-up, and out-put management
- Technology agnostic set-up with options to choose from multiple technology providers for core analytics engine.

SUCCESS STORIES

Ticket reduction through predictive analytics for a leading service provider in the UK

Predictive analytics for IP fixed line network (20,000 Cisco nodes). Solution trained with 12 months of historical alarm and ticket data.

30% of prediction accuracy achieved

66.4% of prediction coverage over total faults

Up to **28%** reduction in SA tickets through predictive analysis

Operational improvement of service assurance processes for a Tier 1 operator in Belgium

Discovery of service assurance process to identify improvement opportunities within B2B service assurance processes to improve operational efficiency, service quality, and scalability.

15%-19% improvement in SLA performance

15% reduction in early life failures

10%-15% OPEX improvement

Productivity improvement due to auto ticket creation for a South African telco

Scope addresses the challenge due to delay in ticket creation and acknowledgement by implementing TCTS BOT solution in enterprise NOC operations.

~700 man-hours saved per month

60% reduction in handling time

100% accuracy of reporting

80% efficiency enhancement

Managed NOC services for wireline and enterprise network for an Indian carrier service provider

Transport, IP network, fibre management, proactive risk assessment through tools and E2E automation for all services.

15%-20% MTTR improvement

70% improvement in proactive tickets

20% reduction in TCO through service optimisation & improved FTR

Vishwanath Shekhar

Head - Tools & Platforms, TCTS

Vishwanath Shekhar is the Head of Automation Tools and Platforms at TCTS. He has been instrumental in conceiving, planning and realizing digital, AI/ML-enabled OSS tools and platforms at TCTS.

With over 20 years of experience in Telecom and Digital Platform Development and Management, he is a leader par excellence driving innovations with his keen insights.

He is a Mechanical Engineer and holds a master's degree in Marketing Management from NMIMS, India. He also holds a Master Certification in AI from Purdue University, US.