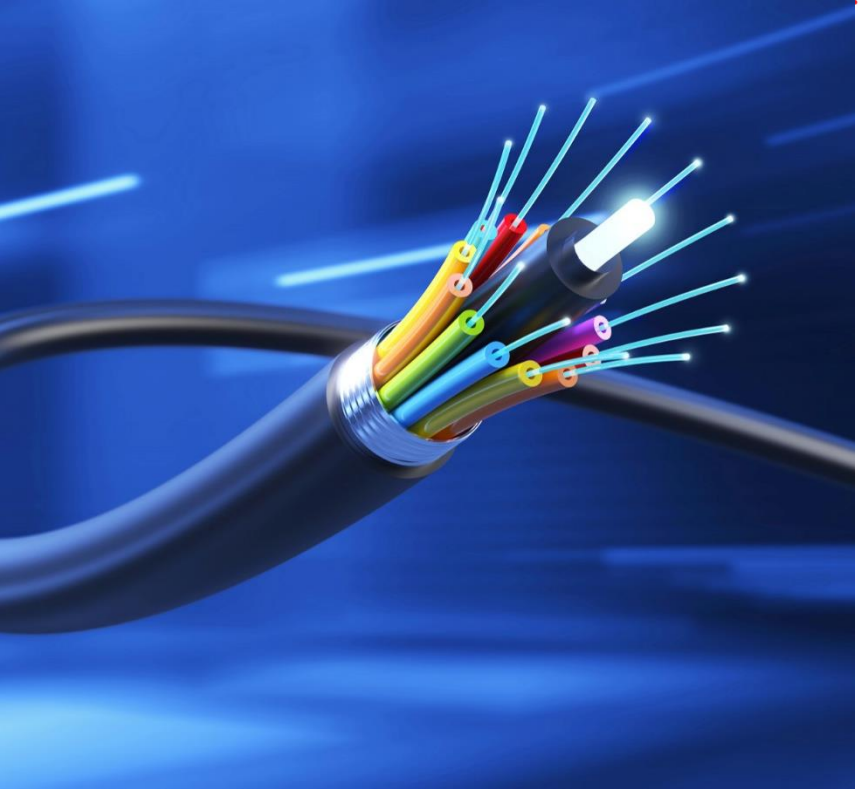


Prodapt

Unleashing high-speed Fiber connectivity

Accelerate Fiber connectivity and reliability with enhanced network orchestration and assurance solutions

Credits

Dibyendu Dey

Rohit Karthikeyan

The rise of Fiber: Growing demand for faster and reliable connectivity

Gartner reports a rising trend among consumers to switch to gigabit Fiber To The Home (FTTH) services, considering connectivity essential

It is forecasted that by 2025, 60% of Tier-1 service providers will adopt 10 Gigabit Symmetrical-PON (XGS-PON) technology on a large scale to provide ultrafast broadband services to both residential and business users

At present, many service providers, especially those providing “triple play” bundles, still rely on Hybrid Fiber Coax (HFC) networks. These networks encompass multiple legacy systems and are not compliant with TM Forum standards

Hence, service providers are investing in XGS-PON technology to meet the rising demand for FTTH to improve network quality and Customer Experience (CX)

Prodapt

Factors impeding the delivery of future-ready Fiber broadband and integrated services

Challenges in delivering Fiber broadband and connected services like TV & phone

Delay in service provisioning due to over dependency on manual processes

Slow or unreliable connectivity leading to **poor customer experience**

Managing diversified & complex hybrid network efficiently

Inability to fulfil network requirements due to **legacy systems**

Delays in issue detection, troubleshooting, and resolution leading to low customer satisfaction

Inability to gain real-time view of the whole network due to the use of multiple network technologies

40% of new users' key buying factors and churn are influenced by their **Fiber network experience**

Source: McKinsey

An enhanced solution for effectively managing complex hybrid networks lies in the implementation of advanced Fiber network orchestration and assurance methods. They offer a unified approach to automation, quick service provisioning, reliable service delivery, and reduced vendor dependency

→ Orchestration is the automation & management of network resources and services, accelerating service provisioning

→ Assurance ensures delivery of network services with the required quality, reliability, and performance

Fast-tracking Fiber: Essential enablers for network transformation success

Fiber network lifecycle

The lifecycle of a fiber network encompasses different stages, starting from planning, design, and build services to orchestration and assurance. For planning, design and build services, refer to the insight.
This insight focuses on exploring critical factors that enable orchestration, assurance, and visualization

Fiber plan, design, and build services

This phase has been addressed in the following 2 insights –

1. Accelerate fiber rollout using a digital workflow strategy
2. Design digitization for faster fiber deployment

Fiber network orchestration
Objective: Zero Touch Provisioning

Orchestrate Fiber and integrated service for network service activation

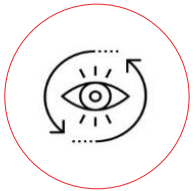
1

Fiber assurance
Objective: Near-zero Touch Operations

Ensure a reliable Fiber network with **automated detection of issue** and remediation

2

Fiber network visualization
Objective: 360° view



Achieve a holistic view of Fiber networks through a **real-time visualization framework**

3

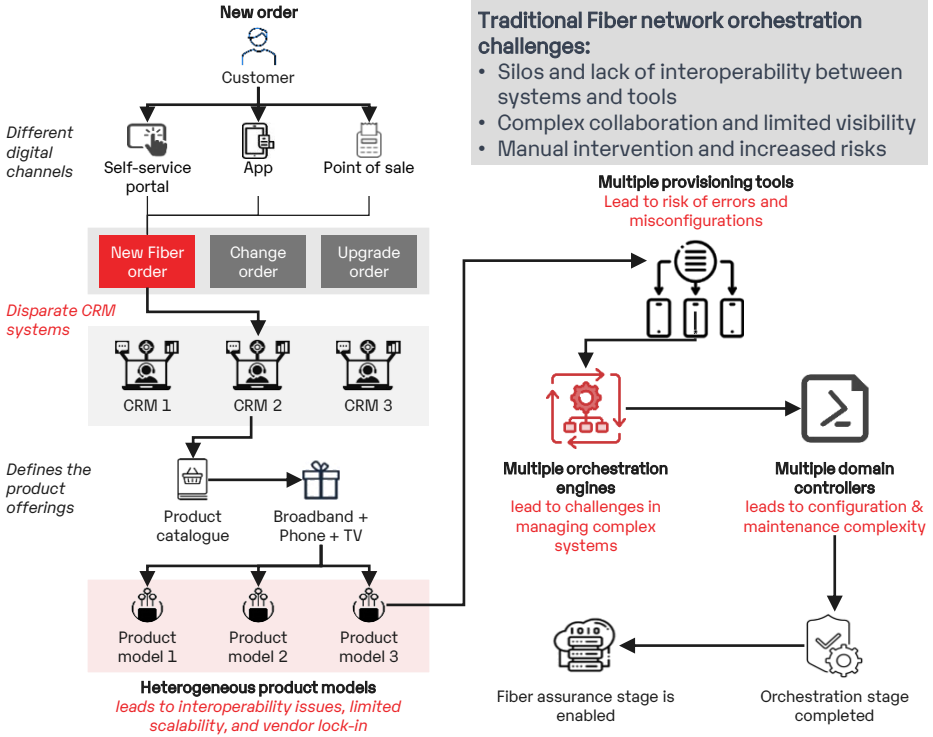
With 60% faster service provisioning through these enablers, service providers can accelerate their journey towards "Fiber for Future"

Orchestrate Fiber and integrated service for network service activation

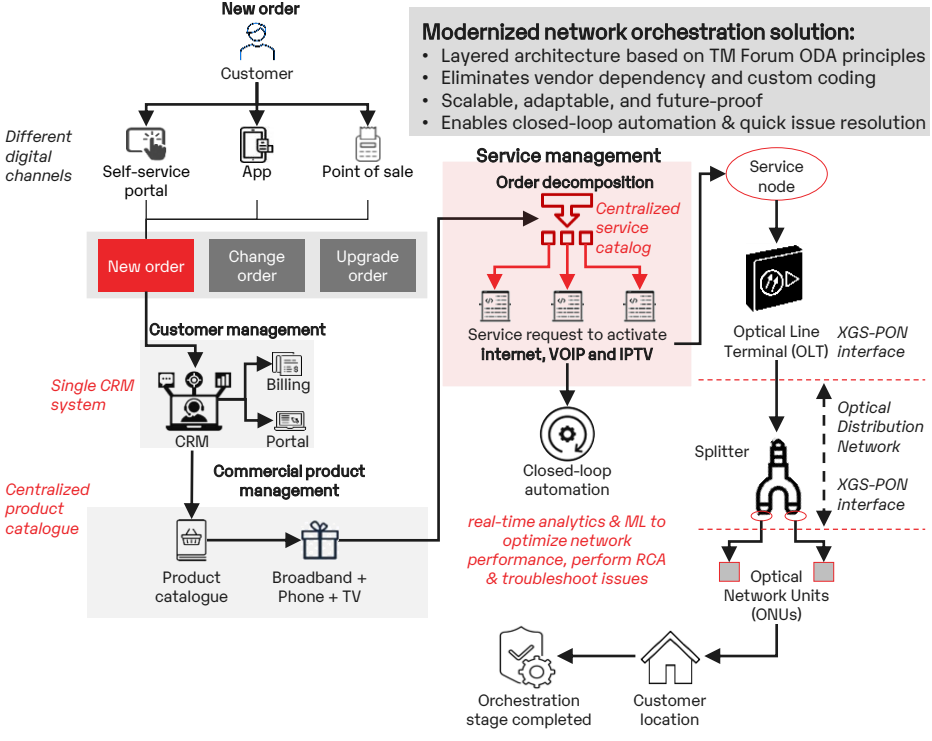
1 A B C 2 3

Traditional Fiber network orchestration faces operational limitations and lack of system collaboration. A modernized approach based on TM Forum ODA principles enables scalability, automation, and efficiency.

Traditional Fiber network orchestration flow



Modernized Fiber network orchestration flow

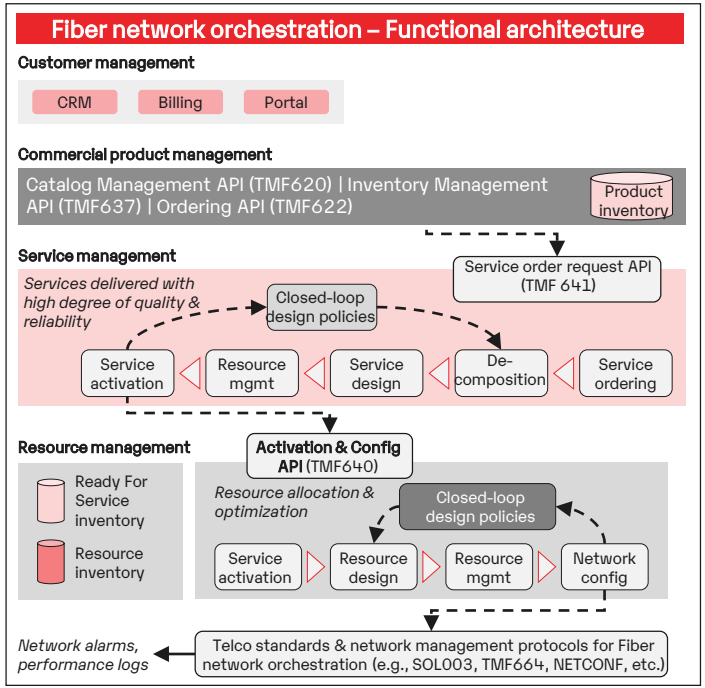


Prodapt

Orchestrate Fiber and integrated service for network service activation

1 2 3
A B C

TM Forum's standardized and intent-driven approach orchestrates XGS-PON, facilitating seamless communication across systems with vendor-agnostic capabilities and open-API integration.



Best practice implementation approach for enabling zero-touch network service activation

	Implementation approach	Objective
STEP 0	Implement layered service orchestration at three different levels, **following the guidelines provided by TM Forum ODA**	Create a structured & efficient framework for managing and coordinating services
STEP 1	Use the TMForum Shared Information & Data (SID) model to **define a comprehensive service catalog**, tailored to triple play services	Categorize services, enabling communication & interoperability among stakeholders
STEP 2	Define Service Ordering API (TMF 641) and orchestration in the service order manager, **facilitating handling of internet connection** and CPE installation requests	Establish a streamlined system for managing/ fulfilling service requests
STEP 3	**Utilize resource-facing services to activate** the service by requesting through Activation & Config API (TMF 640) with necessary configurations	Enable services by submitting activation requests through a designated protocol
STEP 4	Request **domain controller configuration using REST API**, NETCONF, or other suitable protocols, adhering to standardized models like Yang	Properly configure & set up the network elements to support the activation of the network
STEP 5	**Implement a fully automated process** for service activation, supported by a robust exceptional handling framework	Achieve reliable service activation through automation and effective error handling
STEP 6	**Maintain service inventory** by populating TMF SID-based data model (TMF 638 API) & discover resource inventory with Resource Inventory Management API (TMF 639)	Maintain accurate service & resource inventory data for effective service activation

Prodapt

Orchestrate Fiber and integrated service for network service activation

1 2 3
A B C

Recommendations

- Ensure uniformity in information model (Information Framework) across functionalities (Application Framework), processes (Business Process Framework), and integrations (OpenAPIs), by using TM Forum ODA, for accurate and timely service delivery
- Use Open API-based integration like Service Inventory (TMF-638), Resource Inventory (TMF-639), Activation & Configuration (TMF-640), and Service Order Request (TMF-641), to enable seamless communication between different systems involved in E2E service activation process such as order management, inventory management, network configuration, and service activation, to seamlessly exchange data and execute tasks in a synchronized manner.
- Build a Center of Excellence for modeling and orchestration design stages, to execute unified vision across service streams – catalog, integration, & orchestration
- Manage complex orchestration scenarios through well-defined APIs, particularly in tasks such as facilitating multi-service activation, bundling, and cross-selling, integrating diverse vendors & networks for seamless activation, requests for change or upgrade orders, etc.
- Enable E2E visibility into the product, service, and resource specifications through unified service modelling

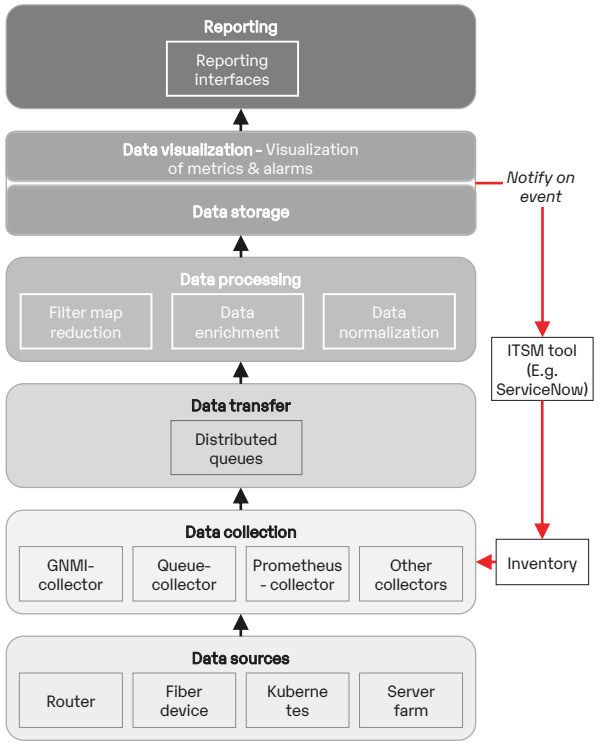
Benefits

- Enable service activation within 24 hours by leveraging the recommended implementation approach
- Effective management of end-to-end network and service life cycles
- Data-driven low-code platform enabling NetDevOps capabilities

Ensure a reliable Fiber network with **automated detection of issue** and remediation

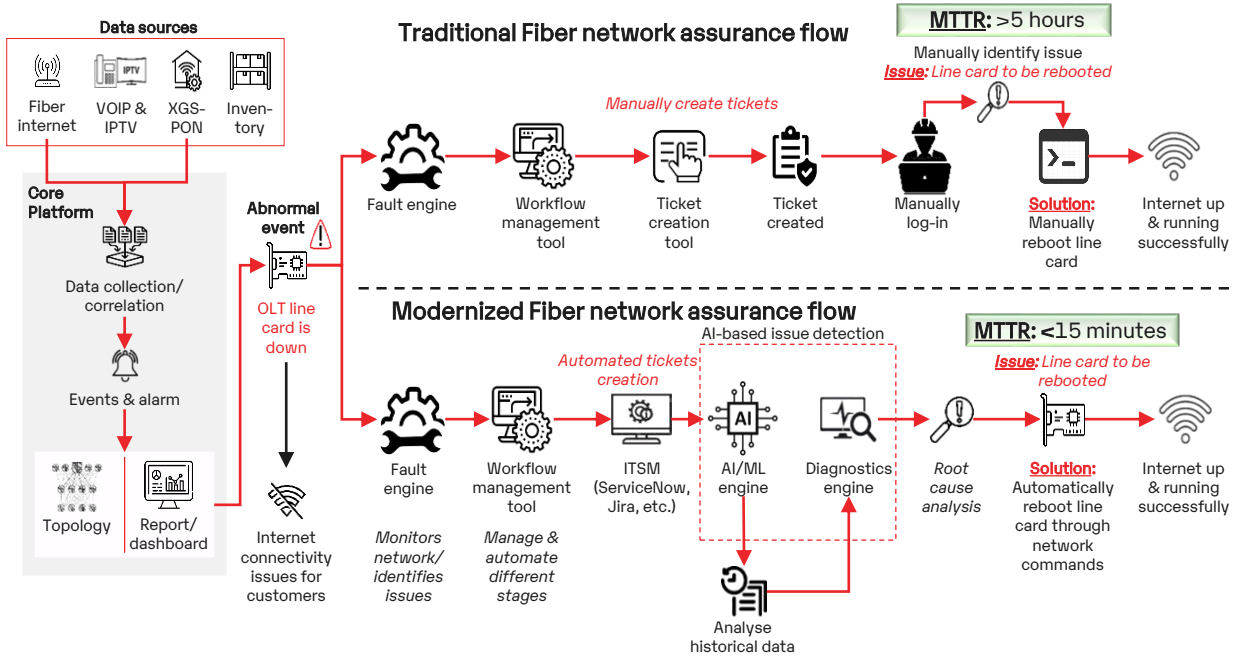
1 2 A B C 3

Fiber network service assurance - Functional architecture



Use case: Traditional vs modernized Fiber network service assurance

The fiber network assurance process encompasses identification and resolution of issues
Traditional method: Restoration of internet requires manual identification of OLT issue, ticket creation, login, and reboot.
Modernized method: An **AI/ML engine** can analyze historical data to identify and suggest remedial actions.



Prodapt

Ensure a reliable Fiber network with **automated detection of issue** and remediation

1 2 3
A B C

Best practice implementation approach for network service assurance and accelerating MTTR

STEP 01 **Uniform network integration or data collection layers:**

Leverage **microservices** to seamlessly integrate the network, utilizing the platform and protocols it supports. This **integration layer** is vendor and protocol agnostic and supports creating adapters for network element managers and individual elements.

STEP 02 **Data enrichment and correlation:**

Subject the collected data through enrichment and correlation processes. **Pre-defined rules** and **AI/ML-driven approaches** are used to identify correlations within the data. This step enhances the quality of the collected data.

STEP 03 **Inventory federation and topology creation:**

Collect **active & passive inventory data**, which includes information about network elements. This data is correlated to create an E2E **network topology**, using which operators can expedite fault identification, and perform RCA, reducing MTTR.

STEP 04 **Visualization and dashboard creation:**

Develop **visualizations** and **dashboards** to facilitate **network data analysis**. Aggregated data is presented as network health widgets, allowing for in-depth analysis from topology to time-series data.

STEP 05 **AI/ML engine:**

Integrate automation engine into the solution, leveraging automation and AIOps solutions. This integration enables auto-ticket creation/categorization, auto-troubleshooting, and auto-remediation.

STEP 06 **PON deep diagnosis:**

Enable deep diagnosis, which will facilitate the identification of root causes, error patterns, and signal degradation issues. This targeted troubleshooting and automated diagnostics will accelerate fault diagnosis, reducing MTTR.

STEP 07 **Predictive and prescriptive analytics:**

Incorporate analytical engine to enhance the assurance services. By leveraging predictive & prescriptive analytics, this integration enables accurate anticipation of network faults and offers proactive recommendations specific to Fiber networks.

STEP 08 **Artificial-based decision making:**

Leverage AI techniques to enhance decision-making processes. AI models can be applied to the collected data to derive valuable insights and make informed decisions for network management and maintenance.

Ensure a reliable Fiber network with **automated detection of issue** and remediation

Recommendations

- Utilize a vendor-agnostic, scalable, cloud-native, and cost-effective assurance solution, to effectively manage intricate and multifaceted hybrid networks, which typically involve a combination of legacy networks with modern cloud-based networks
- Build a flexible and adaptable data ingestion layer to collect data from various Fiber network elements, network managers or domain controllers. It should support multi-domain, multi-vendor, and multi-technology integrations and facilitate communication through multi-protocols
- Collect data from various sources in real time and correlate them through pre-defined dynamic correlation rules and algorithms, using AI/ML
- Use Prometheus, a time series database, that works by polling metrics endpoints and processing data exposed by endpoints
- Produce dashboards in Grafana for various Fiber network components (OLT, ONT, RG, BNG, L2 Switch, etc.) and services (Internet, VOIP, IPTV and others)
- Take a powerful diagnostic engine and troubleshooting approach to effectively manage complexities and order fallouts in Fiber networks. E.g., Use Nokia Network Analyzer - Fiber (NA-F) or a customized tool based on open-source technology to test and analyze fiber optic networks

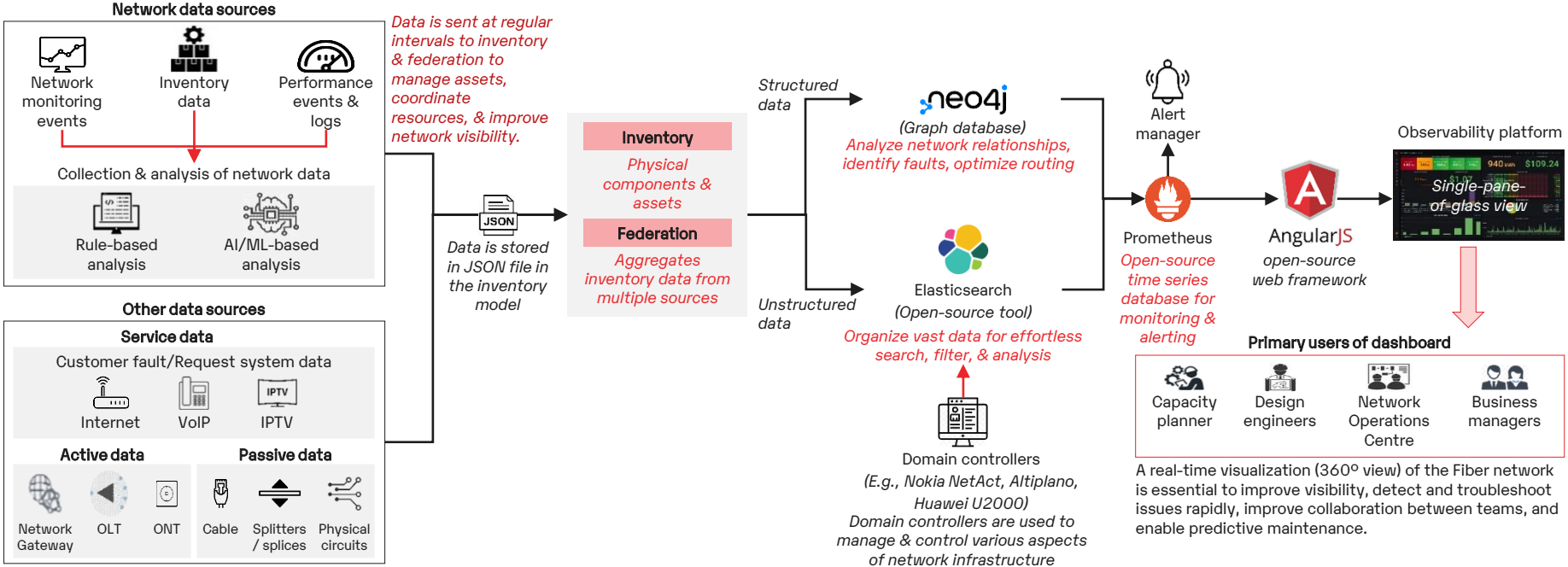
Benefits

- 50-70% faster Mean Time to Resolution (MTTR)
- Optimized costs and improved customer centricity for the service providers
- Enhanced efficiency through AI-powered use cases for tickets categorization, predictive maintenance, network performance KPIs, and anomaly detection

Achieve a holistic view of Fiber networks through a **real-time visualization framework**

1 2 3 A B C

The use of multiple network technologies and complex topologies makes it difficult for service providers to obtain a real-time view of the entire network. Therefore, it is necessary to have a comprehensive and real-time view of the network to gain insight. The Fiber network visualization framework recommended below aims to provide stakeholders with a 360° view of the Fiber network, including events & alarms, inventory topology, and other relevant information.

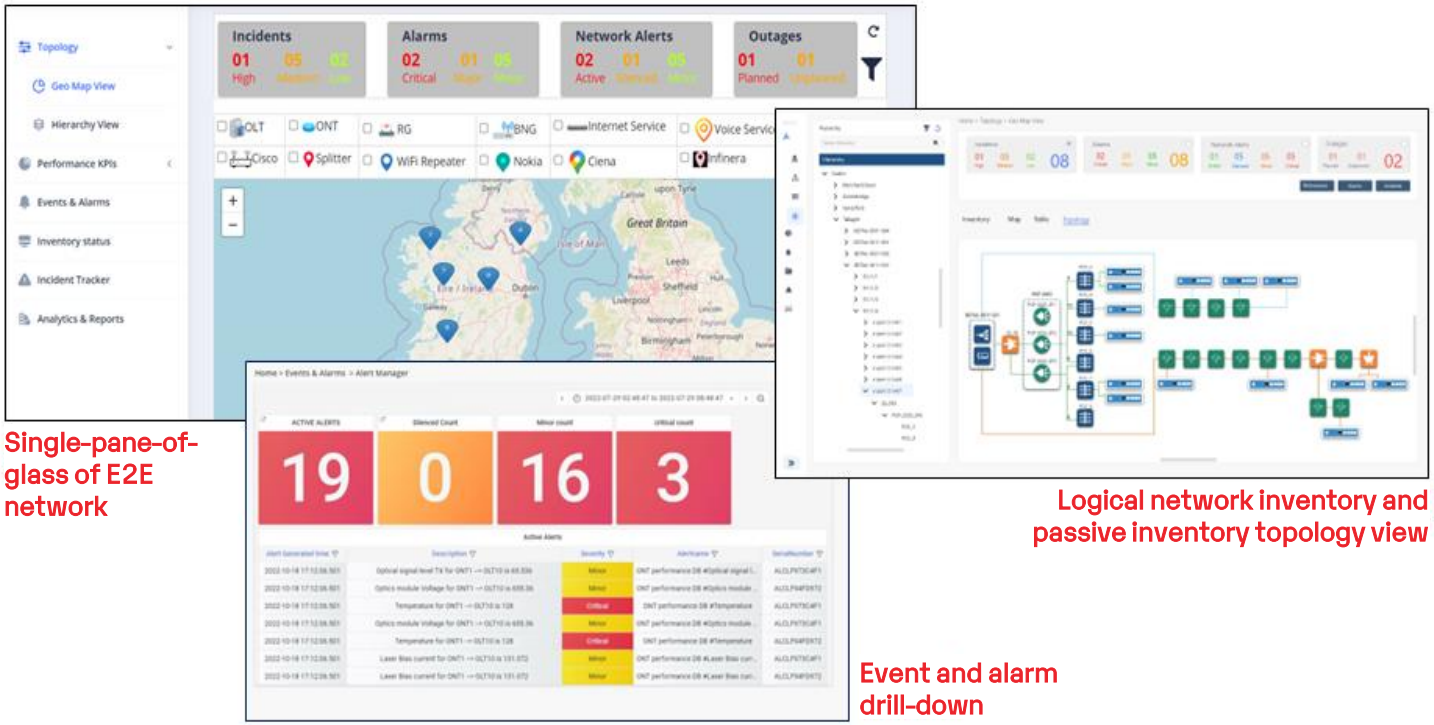


Prodapt

Achieve a holistic view of Fiber networks through a **real-time visualization framework**

1 2 3
A B C

Sample screen-shots - Topology of XGS-PON network through a single-pane-of-glass view



Single-pane-of-glass of E2E network

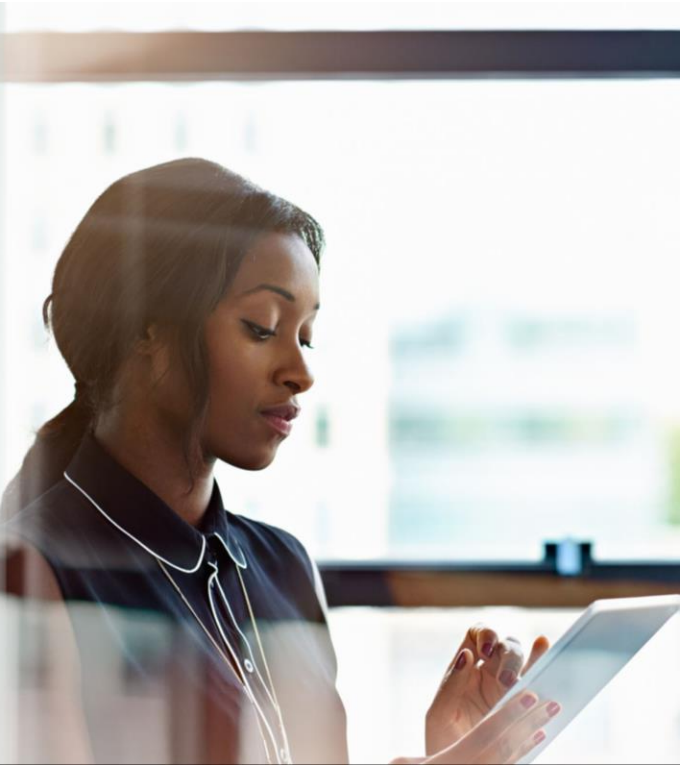
Logical network inventory and passive inventory topology view

Event and alarm drill-down

Prodapt

Achieve a holistic view of Fiber networks through a **real-time visualization framework**

1 2 3
A B C



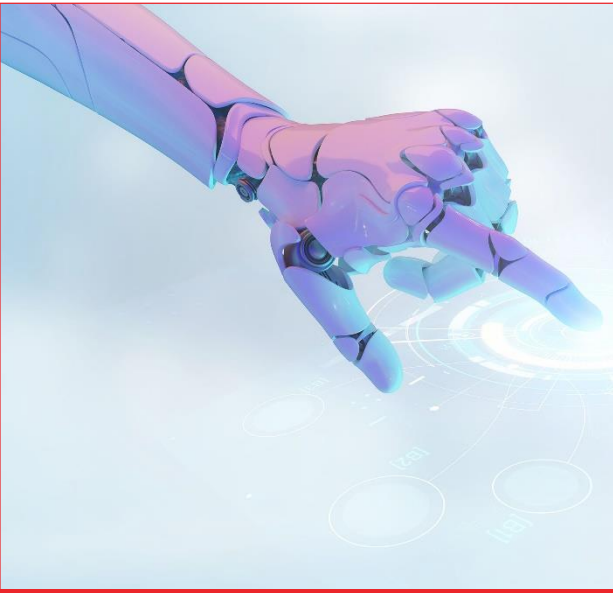
Recommendations

- Build a federation layer of inventories and network alarms, events, logs, traces, using Elasticsearch or Neo4j as data store
- Ingest monitoring integrations, incidents, and alarm data in common data structure from existing and new platforms in data store using specific adapters, based on Python
- Store the fiber network data in JSON files in the inventory model to leverage several advantages in terms of flexibility, compatibility, accessibility, and scalability
- Identify and filter disparate systems, equipment, circuits, and subcomponent details, to gain a comprehensive and organized visualization of the network infrastructure. This aids in understanding the network's structure and enables clear presentation of data in real-time
- Leverage tools such as ArcGIS, OpenStreetMap, and Google Maps to support geographical visualization by integrating them with the visualization framework

Benefits

- The visualization framework serves as a single point of truth, facilitating collaboration and enabling faster decision-making among network design engineers, NOC teams, and business managers. They can access and utilize the same data in formats tailored to their needs
- Improved user experience through simplified views of network and easy to use functionalities

Projected business benefits based on past industry data



Network Orchestration:

60%
Faster service provisioning

30-50%
Reduction in manual workload due to closed loop automation

Network Assurance:

50-70%
Faster Mean Time to Resolution (MTTR)

50%
Reduction in false alarm handling time

35%
Reduction in workforce

Faster Time to Market with accelerated delivery of MVP solutions

Simplified stack and optimized process through **automations & AI/ML**

Enable new revenue generation by onboarding wholesale & offnet partners

Thank you