myresearchgo Volume 2, Issue 6, June 2026, ISSN: 3107-3816 (Online)

# FIBERFLOW
# Empowering ISPs

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**Abstract:** The FiberFlow is a comprehensive Flutter-based application tailored for Internet Service Providers (ISPs) to efficiently manage and monitor their fiber-optic infrastructure and user networks. Developed with a mobile-first approach, FiberFlow addresses the long-standing issue of decentralized and outdated data management within ISP operations. Traditionally, engineers relied on Excel files and physical notebooks, resulting in inconsistent and inaccessible network data. FiberFlow revolutionizes this by offering an intuitive, real-time interface for network visualization, asset tracking, and user monitoring using a centralized system accessible on any device. Key features include live FTTH network monitoring, cable root mapping, user status tracking, and historical activity logging. The app integrates BNG, OLT, and ONU mapping onto a single map view, enabling engineers and operators to troubleshoot and manage networks with pinpoint accuracy. Built with modularity and scalability, the solution supports ICMP and SNMP protocols for seamless communication across devices. FiberFlow simplifies complex ISP operations, empowers on-ground engineers with accurate data, and enhances customer service through rapid response capabilities. By leveraging Flutter's cross-platform capabilities, FiberFlow ensures smooth performance across mobile and web platforms, positioning it as an essential tool for modern ISP network management.

**Keywords:** FiberFlow, Fiber Network Management, ISP Infrastructure Monitoring, Flutter Application, Real-time Network Mapping, User Device Tracking, FTTH Monitoring System.

## Introduction:

An Internet Service Provider (ISP) is an organization that provides myriad services related to accessing, using, managing, or participating on the Internet. ISPs today manage multi-layered network infrastructures that span from central offices to customer premises. Field engineers, tasked with deploying, maintaining, and troubleshooting these networks, often rely on ad-hoc methods like handwritten diaries, spreadsheets, or disparate notes to record critical details about fiber routes, device configurations, and customer connections, even the core details. This manual approach not only consumes valuable time but also introduces risks: entries can be incomplete or inconsistent; data becomes siloed within individual engineers' records; and when an engineer is unavailable or departs the company, their institutional knowledge vanishes, leaving gaps in network visibility and delaying critical repairs. Moreover, as networks grow more complex, incorporating OLTs, ONUs, Mikrotik routers, and managed switches, the challenge of maintaining an accurate, up-to-date topology intensifies. Without a unified platform, ISPs struggle to pinpoint fault locations, track fiber performance over

time, or quickly respond to customer outages. This fragmentation directly impacts service reliability, increases mean time to repair, and ultimately undermines customer satisfaction and operational efficiency. FiberFlow addresses these challenges by offering a centralized, feature-rich broadband network management platform designed specifically for ISPs and enterprises. It's a real-time, map-based network representation that replaces paper logs with an interactive geographical view of fiber paths, device locations, and customer endpoints. Seamless integration with core devices provides live health and performance metrics, while the Optical Fiber Management module tracks connection endpoints and highlights weak links before they escalate. ONU mapping and monthly power-history charts enable proactive maintenance, and the built-in ticketing and task module ensures that issues are logged, assigned, and resolved systematically. Crucially, FiberFlow's centralized customer and lead-management databases preserve all field data within the platform, safeguarding network knowledge even when personnel change. By unifying device monitoring, fiber analytics, and customer information, FiberFlow transforms what was once a manual, error-prone process into an automated, transparent workflow, empowering ISPs to reduce downtime, optimize resources, and deliver superior service.

## Literature Review:

[1] "Evolving to an SDN-Enabled ISP Backbone: Key Technologies and Applications" by Martin Birk, Gagan Choudhury, Bruce Cortez, Alvin Goddard, Narayan Padi, Aswatnarayan Raghuram, Kathy Tse, Simon Tse, Andrew Wallace, and Kang Xi.

[2] "The broadband Internet access market: The changing role of ISPs" by Annemijn F. van Gorp a, Carleen F. Maitland b, Heidemarie Hanekop.

[3] "An empirical model of home internet services quality in Thailand" by Paramaporn Thaichon, Antonio Lobo and Ann Mitsis.

## Research Methodology:

The research methodology for the FiberFlow project followed a structured approach. It emphasized a seamless blend of innovative technology and user-centered design to create an efficient fiber network management application. The methodology focused on ensuring real-time data accuracy and an intuitive user interface. Key stages of development were grounded in agile principles, allowing iterative improvements based on ongoing testing and user feedback. The technical choices reflected a commitment to delivering a robust, scalable, and user-friendly application. Below is a breakdown of the core technologies used in this project and their roles:

Flutter (Front-end Development): Used to build the mobile interface, ensuring the app works smoothly on Android devices with a single codebase.

Django (Back-end & Database Management): Integrated to store user data securely, manage user authentication, and synchronize information across devices in real-time.

Google Maps API: Employed to fetch real-time geographical coordinates and mapping layers, enabling precise visualization and overlay of network assets on an interactive map.

Manually Created Models and Controllers: Custom-built models and controllers to manage specific data, ensuring smooth and fast integration with the APIs and allowing flexibility in handling data display and user interactions.

Dart Language: Powers the logic and structure of the application, enabling efficient handling of asynchronous tasks such as fetching and updating data.

By leveraging these technologies, the FiberFlow app delivers a comprehensive solution to real-time changes in the network, ensuring an engaging, efficient, and secure user experience.

**Results:**

The FiberFlow project achieved its objective of delivering a platform for ISPs successfully. The app enables users to effortlessly monitor and manage their fiber-optic infrastructure and user networks, leveraging features such as real-time data updates, price alerts, and a user-friendly interface. Below are the key outcomes, supported by screenshots from the user interface design.

[1] Dashboard Page: The Dashboard Page offers a streamlined, intuitive layout where users can view a list of tracked data, like active and inactive devices, the number of the top 2 types of devices, and wires, Mikrotik information, and the number of total, pending and closed tickets, tasks, and leads.

[2] Map Page: The Map Page is basically a page of geographical layers providing the very exact locations of devices added in the company's network in the form of custom markers, as FiberFlow has an icon for each type of device. These markers are interactive as they open dialogs to show more detailed information about that device, such as connections, core connections, and the action report of that device.

[3] Ticket & Task Page: Ticket and Task pages are moreover similar except for one thing, that is, tickets are only for engineers, as these tickets will be raised for customers' problems and will be assigned only to the engineers. On the other hand, tasks can be assigned to anyone in the company, as tasks would consist of internal upgrades or changes within the company.

[4] Mikrotik & OLT Page: The Mikrotik and OLT page would be the pages containing details information on these topics, respectively, as of their status, etc.

[5] Reports Page: The Reports page will contain an action report that will keep a tally of every change made within the map, even the smallest change of adding an image to the device. This page would be one of the crucial parts of FiberFlow, as every change can be observed from this report.

The outcome of this project highlights the app's capability to serve users with a responsive, data-driven experience. Through its seamless integration of APIs, user-friendly interface, and robust data system, FiberFlow empowers ISPs to store and maintain each detail about all the devices added in the company. The successful deployment of these features demonstrates the app's value as an indispensable tool for both novice and experienced ISPs alike.

**Conclusion:**

We are delighted to announce the successful development and deployment of our application, in line with the initial project proposal. Our team diligently adhered to the project's specifications and implemented a rigorous testing regimen to ensure a robust and reliable product for ISPs. We firmly believe that our application represents a significant advancement in addressing the timing challenges prevalent in the ISP market. By providing ISPs with timely and relevant information, our solution aims to empower users to maintain all the data in the palms of their hands. Moving forward, we are deeply committed to further enhancing our system by incorporating additional features and functionalities to improve the convenience and efficacy of more network functionality. Our dedication to excellence drives us to continually refine our solution to meet the evolving needs of the ISP community.

**Reference:**

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