Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th February 2025. Vol. 4. No. 2; e-ISSN: 2808-4519

# Implementation of an OLT (Optical Line Terminal) Based FTTH (Fiber To The Home) Network in Mandala Jaya Village to Optimize internet Connectivity

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**Abstract**

This research aims to optimize internet connectivity in Mandala Jaya Village through the application of Fiber To The Home (FTTH) technology based on Optical Line Terminal (OLT). This village previously relied on conventional cable network infrastructure which was prone to weather and physical disturbances, thereby reducing the quality of internet services. With research methods based on problem identification, architectural design, implementation, measurement and analysis of results, this research succeeded in evaluating network performance using an Optical Power Meter (OPM) and other testing tools. The results show that the OLT-based FTTH network provides higher speeds, better connection stability, and operational cost efficiency compared to conventional media converters. The optimal attenuation value is measured in the range of -19 dBm to -24 dBm, which is in accordance with international standards. These findings support switching to network infrastructure in similar villages as a more reliable connectivity solution.

***Keywords***: *FTTH, OLT, Internet Connectivity*

## 1. Introduction

In Mandala Jaya Village, the internet has become an indispensable necessity for the community, particularly in accessing information, education, and economic activities. However, the existing internet infrastructure, which still relies on conventional cable technology such as copper cables and Local Area Networks (LAN), faces numerous significant challenges. One of the primary issues is the frequent network disruptions, especially during extreme weather conditions. Lightning strikes and physical damage to cables often lead to connectivity interruptions, significantly hampering the daily activities of the residents.
To address this pressing issue, I propose the implementation of Fiber To The Home (FTTH) technology based on Optical Line Terminal (OLT) as an innovative solution. FTTH technology offers superior reliability and resilience against environmental disturbances while providing high-speed internet connectivity with enhanced stability.

The internet infrastructure in Mandala Jaya Village remains limited, relying on conventional cable technology such as copper cables and LAN, which are highly susceptible to physical damage and adverse weather conditions. A major challenge encountered is the restricted internet speed. The use of copper cables results in inadequate connectivity for modern necessities such as video streaming, online conferences, and cloud-based services. Moreover, the dependence on copper cables incurs substantial maintenance costs, as these cables frequently require repairs, particularly after damage caused by severe weather or material degradation. This problem is also a primary cause of recurring connectivity disruptions, further exacerbating the deterioration of the existing internet infrastructure.

According to [1], maintaining an FTTH network based on OLT requires a well-structured approach to ensure optimal performance and stable internet connectivity. Routine maintenance of fiber optic cables, along with systematic inspections of OLT (Optical Line Terminal), is essential to ensure that the equipment remains in optimal condition. Additionally, periodic evaluations of ONT (Optical Network Terminal) must be conducted to maintain stable connectivity, accompanied by scheduled resets and device restarts, as well as planned maintenance activities. Efficient network fault management is also a top priority, necessitating swift response procedures to promptly address issues and provide responsive customer service.

According to [2], the Fiber Optic Calculator application plays a crucial role in predicting the appropriate splitter ratio and passive splitter values within the network, with the aim of minimizing attenuation and sustaining connection performance. This study compares simulation results obtained from the application with field measurements conducted using an Optical Power Meter (OPM) to assess the effectiveness of the network design and ensure optimal performance.
According to [3], fulfilling the demand for high-speed, secure, and reliable internet access is of paramount importance. GPON (Gigabit Passive Optical Network) has been selected as the preferred technology due to its capability to deliver significantly faster connections while efficiently accommodating a larger number of users compared to conventional copper cables.

Mandala Jaya Village consists of five hamlets, each separated by a considerable distance, posing significant challenges for network infrastructure. The risk of frequent damage increases if media converters are utilized beyond their optimal lifespan. The hamlets within Mandala Jaya Village include Babakan, Situ, Cihieum, Legok, and Pereng. Among these, Babakan, Situ, and Cihieum have successfully implemented FTTH-based OLT technology. Conversely, Legok and Pereng still rely on media converters, which remain susceptible to performance limitations and maintenance issues.

## 2. Literature Review

The study conducted at this stage comprises several key aspects, each of which is closely related to the research being undertaken. The following are the steps implemented in this research.

### 2.1. FTTH Based on GPON

In this medium, the internet network operates more optimally compared to using media converters. While GPON and OLT are closely related, their distinction lies in their functionality—GPON is a network communication technology, whereas OLT is a fiber optic network device that forms part of the GPON system. This technology is highly efficient due to its cost-effectiveness and ease of maintenance [4], [5], [3], [6], [7], [8]. This research is supported by various sources, enabling comprehensive comparisons of network performance and potential factors that may disrupt connectivity.

### 2.2. Information

This study focuses on the design and optimization of an FTTH (Fiber To The Home) network. The proposed design involves restructuring the network topology in several hamlets that currently rely on media converters by transitioning to OLT-based infrastructure. This transition reduces maintenance costs and minimizes the frequency of network failures. The use of network topology is crucial in determining the precise locations for installation, ensuring an efficient layout of network components [8], [9], [10].

### 2.3. Previous Studies

Previous research [8], [9], [10] has primarily explored optimizing internet networks in terms of quality and bandwidth distribution. The core focus of these studies includes analyzing user requirements, strategic placement of network devices such as OLT and ONU, as well as planning network topology, cable distribution, and Optical Distribution Points (ODP). These studies have successfully demonstrated that network optimization not only enhances performance but also significantly reduces installation and maintenance costs compared to using media converters.

## 3. Research Method

This research methodology consists of six main stages: Problem Identification, Architectural Design, Architectural Implementation, Measurement/Testing, Results Analysis, and Conclusion.The first stage, **Problem Identification**, aims to gather information and understand the primary issues to be addressed. Information is collected through interviews with customers and direct observations at their homes whenever network disruptions occur. Next, in the **Architectural Design** stage, the proposed solution is developed in the form of a system model or architecture, encompassing technical elements and workflow. The selection of OLT system locations considers geographical positioning—if a location is far from the server and susceptible to latency or packet loss, it is prioritized for installation.
The **Architectural Implementation** stage follows, where the design is transformed into a functional prototype or system through software, hardware development, or a combination of both. Once implementation is completed, the **Measurement/Testing** phase is conducted to evaluate system performance through trials. Testing is performed using an **Optical Power Meter (OPM)** to measure attenuation levels post-installation. Additionally, speed tests and ping tests are conducted on the installed routers to assess network stability. The data obtained from testing is then analyzed in the **Results Analysis** stage to assess the effectiveness of the proposed solution and identify areas that require improvement. Finally, in the **Conclusion** stage, the researcher summarizes the findings and provides recommendations for future development. This research methodology offers several advantages that enhance its effectiveness in addressing technology-based problems. Its structured and systematic approach enables researchers to manage projects in an organized manner. Additionally, this method is highly flexible, making it applicable to various fields of research, particularly those involving technology or systems. With this combination of strengths, the methodology not only produces measurable solutions but also lays a strong foundation for further development in the future.

### 3.1. Data Source

The data for this research was obtained through direct observation and experiments conducted over a specific period. The experiment involved replacing **Media Converters** with **OLT (Optical Line Terminal)**. A **Media Converter** is a long-distance transmission device used to convert signals from Fiber Optic cables to LAN (Local Area Network) cables over a specific distance, with a maximum transmission range of 100 meters.

1. **Equipment Used for Media Converter Installation:**
2. **Network cables (Ethernet),** such as UTP (Unshielded Twisted Pair) cables with RJ45 connectors.
3. **Fiber optic cables.**
4. **Power source for the Media Converter,** such as an electrical adapter or PoE (Power over Ethernet) if supported.
5. **Additional tools,** including a crimping tool, wire cutter, and passthrough connector.

**Steps for Media Converter Installation:**

1. **Fiber Optic Cable Installation**
   Install the fiber optic cable with the appropriate connectors (e.g., SC or LC). Connect one end of the cable to the Fiber Optic

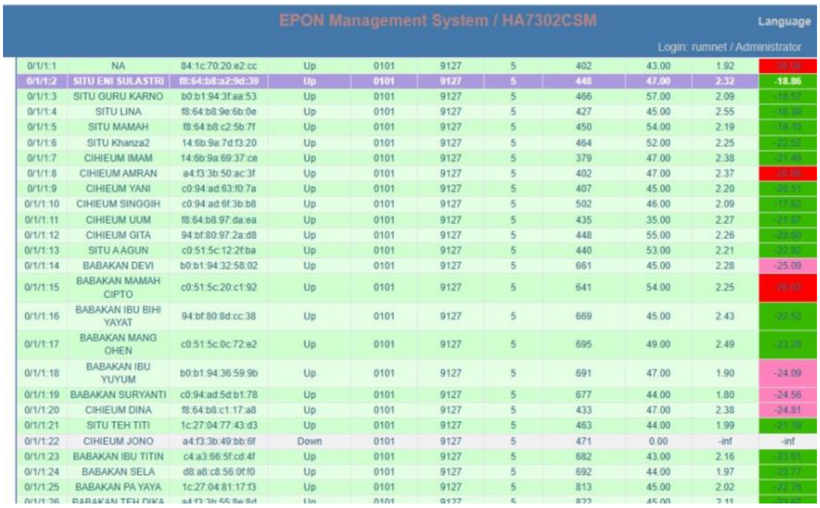
port on the Media Converter and the other end to the receiving device. After installation, check the fiber optic cable to ensure there is no power loss.

2. **Ethernet Cable Installation**
   Connect one end of the Ethernet cable to the network device (such as a router, switch, or computer) and the other end to the RJ45 port on the Media Converter.
3. **Power Supply Installation**
   Plug the power adapter into the Media Converter, turn on the device, and check the power indicator. The LED indicator will confirm that the device is active.
4. **Network Configuration**
   Some Media Converters require manual configuration. Ensure the settings align with the network's requirements.
5. **Connectivity Testing**
   Conduct a connectivity test after installation to confirm that there is no power loss or latency. This can be done through a simple **ping test** between connected devices.

This experiment was conducted in **five hamlets** within **Desa Mandala Jaya**: **Dusun Babakan, Dusun Legok, Dusun Situ, Dusun Cihieum, and Dusun Pereng**. Among these, three hamlets—**Dusun Babakan, Dusun Situ, and Dusun Cihieum**—successfully transitioned from Media Converters to FTTH-based **OLT networks**. Based on the experimental results, **network connectivity in these three hamlets significantly improved** compared to **Dusun Legok and Dusun Pereng**, which still rely on Media Converters.
This research was conducted in collaboration with **Mr. Dea Teddy Setiawan**, the owner of a **Wi-Fi network business in Desa Mandala Jaya**, who also served as an observational partner for field studies. The observations included **direct interactions with customers** to understand their internet experience **before and after the transition to the FTTH network**.

### 3.2. Data Collection Techniques

Mandala Jaya Village consists of five hamlets: Dusun Babakan, Dusun Situ, Dusun Legok, Dusun Cihieum, and Dusun Pereng. These hamlets are considerably distant from one another, requiring a large amount of cabling for network installation. This condition has led to power loss due to unstable connections. Over the past year, **20 customers** have experienced **lightning strikes damaging their routers**. This situation has further demonstrated that **LAN-based networks and Media Converters are inadequate** for Mandala Jaya Village.Currently, an **FTTH (Fiber To The Home) system based on OLT (Optical Line Terminal)** has been **successfully implemented** in **three hamlets**: **Dusun Babakan, Dusun Situ, and Dusun Cihieum**, as illustrated in the following image.


EPON Management System / HA7302CSM
Language
Login: rumnet / Administrator

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0/1/1:1 | NA | 84:1c:70:20:e2:cc | Up | 0101 | 9127 | 5 | 402 | 43.00 | 1.92 | [illegible] |
| 0/1/1:2 | SITU ENI SULASTRI | f8:64:b8:a2:9d:39 | Up | 0101 | 9127 | 5 | 448 | 47.00 | 2.32 | -18.86 |
| 0/1/1:3 | SITU GURU KARNO | b0:b1:94:3f:aa:53 | Up | 0101 | 9127 | 5 | 466 | 57.00 | 2.09 | [illegible] |
| 0/1/1:4 | SITU LINA | f8:64:b8:9e:6b:0e | Up | 0101 | 9127 | 5 | 427 | 45.00 | 2.55 | [illegible] |
| 0/1/1:5 | SITU MAMAH | f8:64:b8:c2:5b:7f | Up | 0101 | 9127 | 5 | 450 | 54.00 | 2.19 | [illegible] |
| 0/1/1:6 | SITU Khanza2 | 14:6b:9a:7d:f3:20 | Up | 0101 | 9127 | 5 | 464 | 52.00 | 2.25 | [illegible] |
| 0/1/1:7 | CIHIEUM IMAM | 14:6b:9a:69:37:ce | Up | 0101 | 9127 | 5 | 379 | 47.00 | 2.38 | [illegible] |
| 0/1/1:8 | CIHIEUM AMRAN | a4:f3:3b:50:ac:3f | Up | 0101 | 9127 | 5 | 402 | 47.00 | 2.37 | [illegible] |
| 0/1/1:9 | CIHIEUM YANI | c0:94:ad:63:f0:7a | Up | 0101 | 9127 | 5 | 407 | 45.00 | 2.20 | [illegible] |
| 0/1/1:10 | CIHIEUM SINGGIH | c0:94:ad:6f:3b:b8 | Up | 0101 | 9127 | 5 | 502 | 46.00 | 2.09 | [illegible] |
| 0/1/1:11 | CIHIEUM UUM | f8:64:b8:97:da:ea | Up | 0101 | 9127 | 5 | 435 | 35.00 | 2.27 | [illegible] |
| 0/1/1:12 | CIHIEUM GITA | 94:bf:80:97:2a:d8 | Up | 0101 | 9127 | 5 | 448 | 55.00 | 2.26 | [illegible] |
| 0/1/1:13 | SITU A AGUN | c0:51:5c:12:2f:ba | Up | 0101 | 9127 | 5 | 440 | 53.00 | 2.21 | [illegible] |
| 0/1/1:14 | BABAKAN DEVI | b0:b1:94:32:58:02 | Up | 0101 | 9127 | 5 | 661 | 45.00 | 2.28 | -25.09 |
| 0/1/1:15 | BABAKAN MAMAH CIPTO | c0:51:5c:20:c1:92 | Up | 0101 | 9127 | 5 | 641 | 54.00 | 2.25 | [illegible] |
| 0/1/1:16 | BABAKAN IBU BIHI YAYAT | 94:bf:80:8d:cc:38 | Up | 0101 | 9127 | 5 | 669 | 45.00 | 2.43 | [illegible] |
| 0/1/1:17 | BABAKAN MANG OHEN | c0:51:5c:0c:72:e2 | Up | 0101 | 9127 | 5 | 695 | 49.00 | 2.49 | [illegible] |
| 0/1/1:18 | BABAKAN IBU YUYUM | b0:b1:94:36:59:9b | Up | 0101 | 9127 | 5 | 691 | 47.00 | 1.90 | -24.09 |
| 0/1/1:19 | BABAKAN SURYANTI | c0:94:ad:5d:b1:78 | Up | 0101 | 9127 | 5 | 677 | 44.00 | 1.80 | -24.56 |
| 0/1/1:20 | CIHIEUM DINA | f8:64:b8:c1:17:a8 | Up | 0101 | 9127 | 5 | 433 | 47.00 | 2.38 | -24.81 |
| 0/1/1:21 | SITU TEH TITI | 1c:27:04:77:43:d3 | Up | 0101 | 9127 | 5 | 463 | 44.00 | 1.99 | [illegible] |
| 0/1/1:22 | CIHIEUM JONO | a4:f3:3b:49:bb:6f | Down | 0101 | 9127 | 5 | 471 | 0.00 | -inf | -inf |
| 0/1/1:23 | BABAKAN IBU TITIN | c4:a3:66:5f:cd:4f | Up | 0101 | 9127 | 5 | 682 | 43.00 | 2.16 | [illegible] |
| 0/1/1:24 | BABAKAN SELA | d8:a8:c8:56:0f:f0 | Up | 0101 | 9127 | 5 | 692 | 44.00 | 1.97 | [illegible] |
| 0/1/1:25 | BABAKAN PA YAYA | 1c:27:04:81:17:f3 | Up | 0101 | 9127 | 5 | 813 | 45.00 | 2.02 | [illegible] |
| 0/1/1:26 | BABAKAN TEH DIKA | [illegible] | Up | 0101 | 9127 | 5 | 822 | 45.00 | 2.11 | [illegible] |

**Fig. 1:** Data Collection Techniques

These three hamlets have a total of **105 customers**, distributed as follows:

- **Dusun Babakan**: **33 customers**
- **Dusun Cihieum**: **38 customers**
- **Dusun Situ**: **34 customers**

The following section presents the **geographical data** of customers who have transitioned to **FTTH-based OLT networks**.

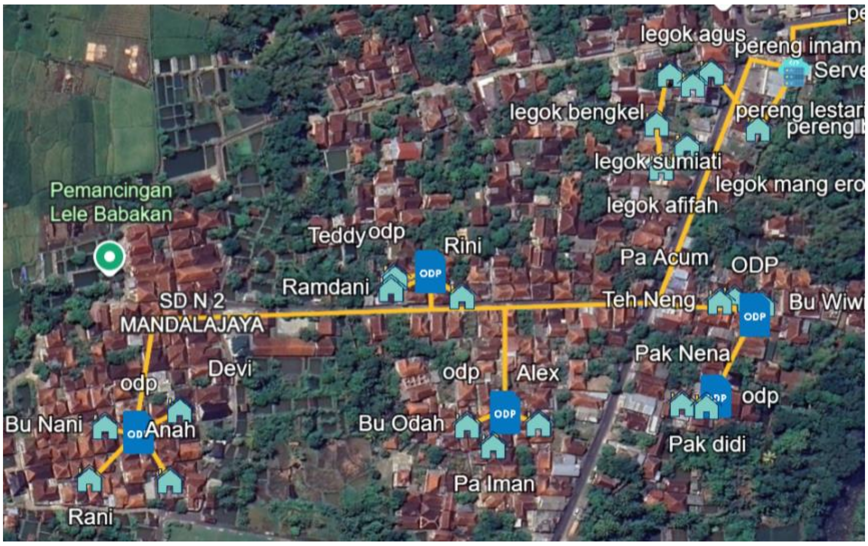



**Fig. 2:** Data Collection Techniques

Media Converters are still in use in **Dusun Legok** and **Dusun Pereng** because the **distance between customers** in these areas is **relatively short**, making it feasible to continue using **LAN (Local Area Network) cables**. Additionally, the **number of customers** in these two hamlets is **relatively low**, with **35 customers in Dusun Legok** and **20 customers in Dusun Pereng**, totaling **55 customers**. For these reasons, transitioning to **FTTH-based OLT networks** has **not been a priority**. However, over time, **both hamlets** have been experiencing **frequent network issues**, including:

- **Latency**
- **Packet loss**
- **Power loss**
- **Cable corrosion**

These issues have led to **unstable connectivity**, highlighting the need for **future network upgrades**. The following section presents the **geographical data** of **Dusun Legok and Dusun Pereng**.


**Fig. 3:** Data Collection Techniques

## 4. Test Results and Discussion

### 4.1. Experimental Results and Discussion

The results of the study revealed significant instability in the network, particularly when using Media Converters. Many of these systems experienced power loss and latency, which can be attributed to the limited range of 100 meters, making them inadequate for long-distance connections. This limitation can lead to higher costs because additional devices like repeaters or switches are required. Moreover, the performance limitations of Media Converters pose a challenge, as they can only provide certain speeds and are dependent on a constant power supply. If a power outage occurs and there is no backup system such as a UPS, connectivity will be disrupted. Additionally, the use of **Media Converters** increases the number of devices in the network, meaning there are more components to **monitor and maintain**. This naturally increases **operational costs** and **maintenance time**. Media Converters are also vulnerable to **physical and environmental disturbances**. **Ethernet cables**, when used with **Media Converters**, are more susceptible to **electromagnetic interference** compared to **fiber optic cables**. Furthermore, **copper cables** are highly sensitive to **physical damage** and **moisture**. Due to these limitations, **Media Converters** are not ideal for **larger user networks**. As a solution, an **FTTH network based on OLT** (Optical Line Terminal) was used, which is **more integrated**, **cost-efficient**, **easier to maintain**, and **less susceptible to physical disturbances**. The research findings indicate that the **FTTH network based on OLT** provides **optimal signal attenuation** in the range of **-19 dBm to -24 dBm**, as confirmed by the measurements using an **Optical Power Meter (OPM)**. This result aligns with findings in existing literature, such as [1], who state that optimal attenuation for **FTTH networks** falls within this range. The **connection stability**, demonstrated by **low latency**, further supports this, as seen in studies such as [3], which highlight that **GPON (Gigabit Passive Optical Network)** in **FTTH systems** is capable of supporting modern services, such as **video streaming**, with minimal latency. In contrast, when using **Media Converters**, the **signal attenuation** recorded was **higher** (-30 dBm or more), indicating the **inefficiency** of the device. This inefficiency aligns with the findings of [2], which emphasize the importance of **network design** to reduce attenuation. Therefore, transitioning to an **FTTH-based OLT** network can be seen as a **pragmatic step** to ensure a **stable and efficient** connection

### 4.1.1. Media Converter Topology

This diagram illustrates the current **Media Converter topology** in **Desa Mandala Jaya**, particularly in **Dusun Legok** and **Dusun Pereng**. The following is an overview of the system's layout and setup:

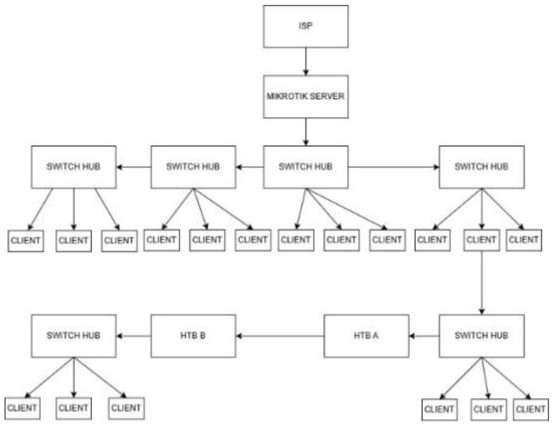



**Fig. 4:** Media Converter Topology

### 4.1.2. Devices Used in Media Converter Installation

After designing the network, the following devices are essential for the **Media Converter installation**:

1. **Switch/Router**: Used to manage and control the distribution of the **Ethernet network**. It ensures the proper routing of data between devices.
2. **Fiber Optic Cable**: Connects the **Media Converter** to the **fiber optic receiver device**, enabling the transmission of data through light signals.
3. **Ethernet Cable**: Connects the **Media Converter** to network devices like **routers**, **switches**, or **computers** using electrical signals to transfer data over the local area network (LAN).
4. **Splitter (Optional)**: Used when a single **fiber optic line** needs to be divided and distributed to multiple devices or locations. This is particularly useful for large networks requiring multiple connections.
5. **Power Supply**: Provides the necessary **electricity** for the **Media Converter** to function. This can include a standard power adapter or **Power over Ethernet (PoE)** if supported by the device.

Once all the required devices are gathered, the next step is to proceed with the **installation** phase to implement the **Media Converter** system.

### 4.1.3. OLT Based FTTH Media Topology

This diagram illustrates the **FTTH (Fiber To The Home) topology based on OLT** that is currently in operation in **Desa Mandala Jaya**, specifically in **Dusun Babakan**, **Dusun Situ**, and **Dusun Cihieum**. Below is an overview of this system:

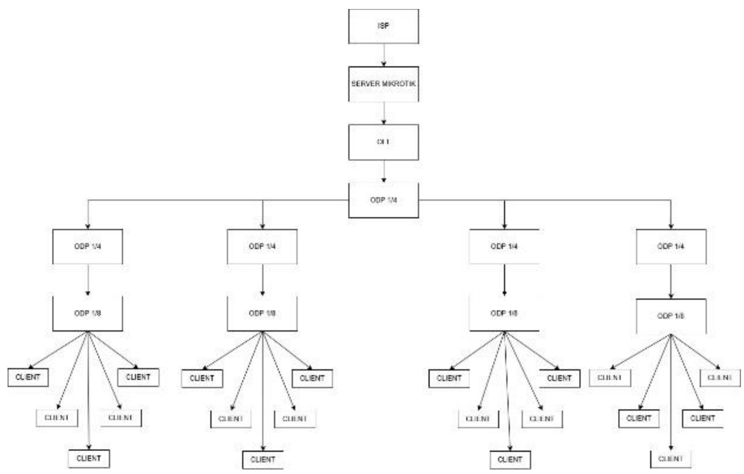



**Fig. 5:** OLT Based FTTH Media Topology

### 4.1.4. Devices Used in FTTH System Based on OLT

After the planning phase, the following devices are required for the installation of the **FTTH (Fiber To The Home)** system based on **OLT (Optical Line Terminal)**:

**Main Devices:**

1. **Optical Line Terminal (OLT)**
   - Acts as the **central distribution point** for the **fiber optic network** from the provider to the customers.
   - Manages **data traffic** and splits the signal to several customers using **optical splitters**.
2. **Optical Network Unit (ONU) / Optical Network Terminal (ONT)**
   - Installed at the customer's location to receive the signal from the OLT via **fiber optic cable**.
   - Converts the **optical signal** into **digital signals**, which can then be used by network devices such as routers or computers.
3. **Optical Splitter**
   - Splits the optical signal from the OLT to multiple paths for different customers.
   - Common splitting ratios are **1:8**, **1:16**, and **1:32**, depending on the number of customers being served.
4. **Fiber Optic Cable**
   - The main cable used to connect the OLT to the **optical splitter**, and from the splitter to the **ONU/ONT**.
5. **Patch Cord**
   - A short cable with connectors on both ends to connect devices such as OLT, splitter, and distribution panels.
6. **Fiber Optic Connectors (SC, LC, FC, etc.)**
   - Connectors used to link the **fiber optic cables** to devices such as the OLT, ONU, or splitter.
7. **Optical Distribution Point (ODP)**
   - A **termination point** for the distribution cable where the main distribution cable ends.
   - Facilitates **signal separation** to multiple customers using an **optical splitter**, typically in configurations like **1:8** or **1:16**.
   - Serves as a **connection hub**, linking the main cable to the **drop cables**.
8. **Optical Power Meter (OPM)**
   - A device used to measure the **attenuation** of the optical fiber cable after installation.
   - The ideal **attenuation** for an **FTTH system** with **OLT** should be between **-19 dBm** and **-24 dBm**.
   - The OPM helps ensure that the **fiber cable** supports proper internet access. If the tool displays a **loss**, it indicates that there is an issue with the fiber optic installation that needs to be addressed.

**Supporting Devices:**

1. **Wi-Fi Router or Ethernet Switch**
   - Used to distribute the internet connection from the **ONU/ONT** to customer devices such as **computers**, **smartphones**, or other network devices.
2. **Ethernet Cable**
   - Connects the **ONU/ONT** to customer devices.
3. **Wi-Fi Splitter (optional)**
   - Extends the **wireless network range** within the customer's home or office.

With these devices, the **FTTH system** based on **OLT** provides reliable, high-speed, and stable internet connectivity to customers.

## 4.2. Discussion

The implementation of FTTH based on OLT in Mandala Jaya Village proves that this technology provides an effective solution to overcome the limitations of the media converter network. These findings support previous literature and provide practical evidence that FTTH can serve as a reliable network infrastructure in rural areas. Moreover, this study also highlights that careful planning and design are key to the successful implementation of fiber optic-based networks. Below is the table and comparison results between media converter and FTTH based on OLT.

### 4.2.1. Implementation of Media Converter

After the installation and configuration of the media converter, checks will be performed. In this checking phase, tests will be conducted using speedtest, ping, and Mikrotik monitoring. Below are the images of the checks performed.

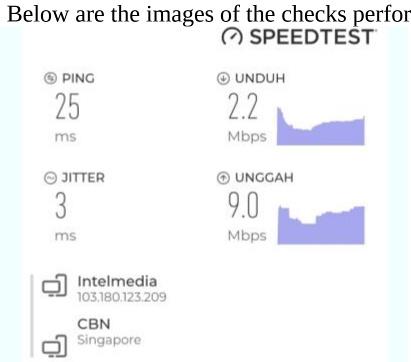



**Fig. 6:** Implementation of Media Converter

After installing and configuring the devices for the customers, the checking phase using speedtest and ping is essential to determine the stability of the devices and assess whether they are suitable for use or not.

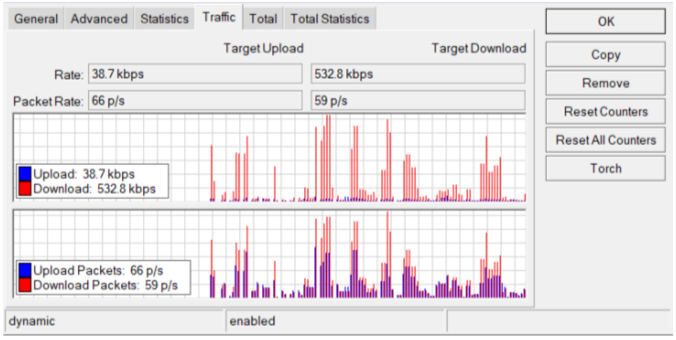



**Fig. 7:** Implementation of Media Converter

Monitoring on Mikrotik is carried out to ensure that the installation and configuration for the customers are active. Additionally, monitoring is also useful for identifying customers who are experiencing network issues. If the graph on Mikrotik does not appear, it indicates a network problem that prevents the device from accessing the internet. Below is the table for media converter clients.

**Tabel 1:** Implementation of Media Converter

| **Client Media Converter** | **Aspek** | | | | |
|---|---|---|---|---|---|
| | **Damping** | **Ping** | **Upload** | **Download** | **Jitter** |
| Legok Agus | -26dBm | 22 ms | 2.2 Mbps | 6.2 Mbps | 15 |
| Legok Sumiati | -24dBm | 25 ms | 3.1 Mbps | 8.7 Mbps | 12 |
| Legok Afifah | -27dBm | 23 ms | 2.9 Mbps | 7.0 Mbps | 18 |
| Legok Mang ero | -25dBm | 25 ms | 3.5 Mbps | 7.5 Mbps | 16 |
| Legok Bengkel | -25dBm | 20 ms | 3.0 Mbps | 9.2 Mbps | 22 |
| Pereng Lestari | -30dBm | 30 ms | 1.8 Mbps | 5.8 Mbps | 25 |
| Pereng bohim | -29dBm | 27 ms | 1.5 Mbps | 5.5 Mbps | 21 |
| Pereng Imam | -23dBm | 19 ms | 3.4 Mbps | 9.0 Mbps | 14 |
| Pereng Uus | -27dBm | 24 ms | 2.1 Mbps | 7.5 Mbps | 17 |
| Pereng Wahidin | -28dBm | 23 ms | 2.0 Mbps | 6.2 Mbps | 18 |
| Pereng Heni | -29dBm | 24 ms | 1.9 Mbps | 6.0 Mbps | 16 |

### 4.2.2. Implementation of FTTH Based on OLT

After the installation and configuration of the FTTH system based on OLT, checks will be performed using speedtest, ping, and Mikrotik monitoring. The following is the image for the checks conducted.

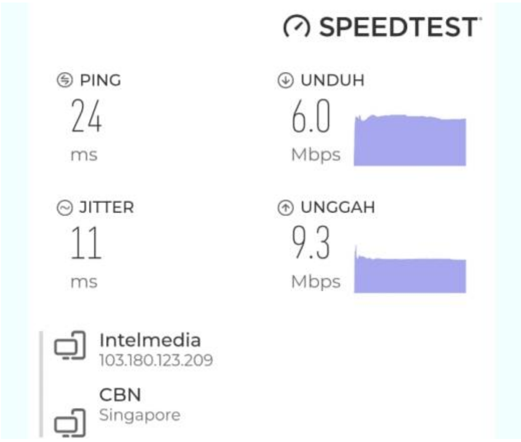



**Fig. 8:** Implementation of FTTH Based on OLT

After installing and configuring the devices for the customers, the checking phase using speedtest and ping is essential to determine the stability of the devices and assess whether they are suitable for use or not.

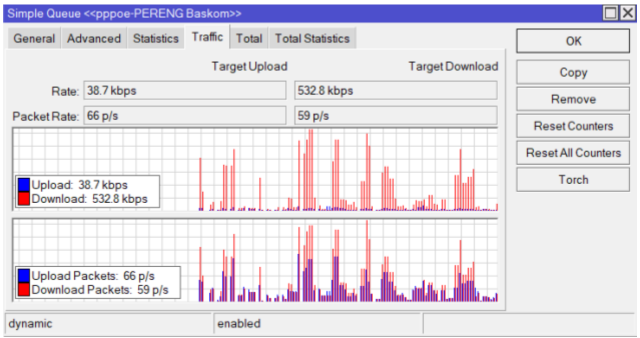



**Fig. 9:** Implementation of FTTH Based on OLT

**Monitoring on Mikrotik** is done to ensure that the installation and configuration for the customer are active. Additionally, monitoring helps identify customers who may be experiencing issues with the network. If the graph on Mikrotik does not appear, it indicates a problem with the network that prevents the device from accessing the internet. Below is the table for FTTH-based OLT clients.

**Tabel 2:** Implementation of FTTH Based on OLT

| Implementation of FTTH Based on OLT | Aspek | | | | |
|---|---|---|---|---|---|
| | Damping | Ping | Upload | Download | Jitter |
| Bu Nani | -21dBm | 14 ms | 4.2 Mbps | 7.2 Mbps | 8 |
| Anah | -22dBm | 15 ms | 5.1 Mbps | 8.7 Mbps | 6 |
| Rani | -21dBm | 13 ms | 3.9 Mbps | 8.0 Mbps | 8 |
| Devi | -20dBm | 15 ms | 3.5 Mbps | 8.5 Mbps | 6 |
| Ramdani | -21dBm | 18 ms | 3.0 Mbps | 9.2 Mbps | 15 |
| Teddy | -19dBm | 11 ms | 5.8 Mbps | 9.8 Mbps | 4 |
| Rini | -20dBm | 19 ms | 2.5 Mbps | 9.5 Mbps | 11 |
| Bu Odah | -22dBm | 15 ms | 3.4 Mbps | 7.0 Mbps | 10 |
| Alex | -20dBm | 16 ms | 3.1 Mbps | 8.5 Mbps | 12 |
| Pak Iman | -21dBm | 17 ms | 4.0 Mbps | 7.2 Mbps | 11 |
| The Neng | -19dBm | 15 ms | 4.9 Mbps | 9.0 Mbps | 10 |

### 4.3. Results of Media Converter and OLT

In this section, the researcher will present the graphical results comparing the performance of media converter and FTTH-based OLT. These results are key to evaluating the effectiveness and efficiency of each solution in terms of signal loss, latency, and overall network stability. The following graphs display the performance metrics for both systems, allowing for a clear comparison of their capabilities.

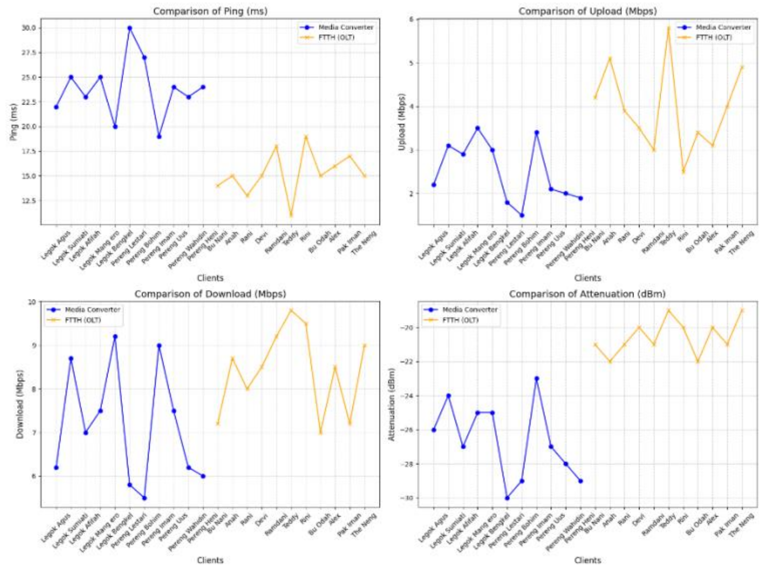



**Fig. 10:** Result of Media Converter and OLT

The graph above shows the comparison between media converter and FTTH-based OLT based on four aspects: Ping, Upload, Download, and Attenuation ("Signal Loss"). Each graph illustrates that FTTH-based OLT performs more stably, with lower ping values, higher upload and download speeds, and lower attenuation. These factors contribute to better network performance, making FTTH-based OLT a more reliable solution compared to the media converter.

## 5. Conclusion

Based on the research results regarding the implementation of FTTH based on OLT in Desa Mandala Jaya, here are the main conclusions that can be drawn:

1. **Internet Stability After Using FTTH**
   The implementation of FTTH based on OLT in Desa Mandala Jaya has proven to significantly improve internet connectivity stability compared to the media converter technology. According to the test results, FTTH shows lower signal attenuation (-19 dBm to -24 dBm) and an increase in access speed up to 1 Gbps, far superior to the media converter, which has high attenuation and limited speed of up to 100 Mbps. This indicates that FTTH provides stable and reliable connectivity quality.

**Mechanism of Replacing Media Converter with OLT**

The transition process from the media converter to FTTH based on OLT involves several stages, including network planning, device installation (OLT, splitter, fiber optic cables), system configuration, and service quality testing using tools like the Optical Power Meter (OPM). Each customer is also equipped with an ONT to convert optical signals into digital signals. This replacement simplifies network management, enhances operational efficiency, and reduces physical and environmental disruptions.

## Acknowledgement

All praise and gratitude are due to Allah SWT for His abundant grace, blessings, and guidance, which enabled the author to complete this research successfully. This research would not have been possible without the support, assistance, and guidance of many parties. Therefore, with the utmost respect and sincerity, the author extends heartfelt thanks to:

1. Assoc. Prof. Dr. Dadang Sudrajat, S.Si., M.Kom, as the Chairman of STMIK IKMI Cirebon.
2. Mr. Dian Ade Kurnia, M.Kom, as Vice Chairman I for Academic Affairs, Collaboration, Research, and Innovation.
3. Mrs. Dra. Nining R, M.Si., as Vice Chairman II for Finance.
4. Mrs. Fatihanursari Dikananda, S.Tr.I.Kom., M.Kom, as Vice Chairman III for Student Affairs and Alumni.
5. Mr. H. Eka Jayawangsa, BBA, as Vice Chairman IV for Facilities and Infrastructure.
6. Mrs. Gifthera Dwilestari, S.I.Kom., M.Kom, as the Head of the Informatics Engineering Study Program.
7. Mrs. Rini Astuti, MT, as the Principal Supervisor.
8. Mr. Willy Prihartono, M.Kom, as the Co-Supervisor.
9. My beloved parents and family, who have consistently provided unwavering support, prayers, and encouragement throughout this academic journey.
10. My friends and all parties who have contributed, directly or indirectly, to the completion of this research.
    May all the kindness and support extended be rewarded manifold by Allah SWT.

## References

[1] Muhammad Ibrahim, Suryayusra, and Alex Wijaya, “Analisis Perencanaan Pembangunan Jaringan Fiber Optik pada Pemerintahan Kota Palembang,” *Sci-tech J.*, vol. 3, no. 1, pp. 74–82, 2024, doi: 10.56709/stj.v3i1.388.

[2] A. Tantoni, M. Taufan, A. Zaen, and K. Imtihan, “Analisis Perbandingan Hasil Aplikasi Fiber Optic Calculator Dengan Impementasi FTTH Pada OLT EPON HSQG,” *KLIK Kaji. Ilm. Inform. dan Komput.*, vol. 3, no. 6, pp. 1108–1120, 2023, doi: 10.30865/klik.v3i6.842.

[3] M. R. Akbar, R. , Rivaldi Julian, and L. N. Alsulaiman, Salas Panji Pamuka, “Perancangan Jaringan Fiber to the Home (FttH) Menggunakan Teknologi Gigabit Pasive Optical Network (GPON) di Perumahan Alam Indah Selaras,” *e-Proceeding Eng.*, vol. 3, no. 1, pp. 576–583, 2023.

[4] J. Susilo, H. Hafidudin, and M. A. Y. Latif, “Perancangan Jaringan Fiber To The Home (ftth) Di Desa Pedan Telkom Klaten Menggunakan Teknologi Gigabit Passive Optical Network (Gpon) Untuk Layanan …,” *eProceedings …*, vol. 4, no. 3, pp. 2700–2707, 2019.

[5] M. Ammar, Nasaruddin, and E. D. Meutia, “Perancangan dan Analisis Kinerja Jaringan Akses Fiber-to-the-Home berbasis Gigabit Passive Optical Network Menggunakan OptiSystem di Kutacane,” *KITEKTRO J. Komputer, Inf. Teknol. dan Elektro*, vol. 8, no. 1, pp. 36–42, 2023.

[6] H. A. Angga, A.Darnawan sidik, “Analisis Redaman pada Jaringan Fiber To The Home (FTTH) Berteknologi Gigabit Passive Optical Network (GPON) di Pt. Telkom Palmerah,” *Angga, A. Darmawan Sidik, Heru Abrianto*, pp. 2406–2418, 2024.

[7] A. Setiawan, “Analisis Jaringan Fiber To The Home Berbasis Teknologi Gigabit Passive Optical Network Dan Penghitungan Downstream (Studi Kasus Perumahan Wirosaban Baru),” *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*, vol. 8, no. 4, pp. 2212–2223, 2021, doi: 10.35957/jatisi.v8i4.1576.

[8] I. S. Khamid, “Perencanaan Jaringan FTTH Berbasis Teknologi GPON Di Desa Salam Magelang,” vol. 6, no. 1, pp. 956–971, 2024.

[9] B. Sastra, I. Diafari Djuni, and N. M. Ary Esta Dewi Wirastuti, “Perancangan Dan Implementasi Jaringan Ftth Gpon Di Cluster Marga,” *J. SPEKTRUM*, vol. 11, no. 1, p. 99, 2024, doi: 10.24843/spektrum.2024.v11.i01.p11.

[10] A. Fatta’ah Ramadhan and A. Stefanie, “Analisis Pembuatan Jaringan Fiber To The Home (FTTH) Di Perum Bumi Karawang Baru,” *J. Ilm. Wahana Pendidikan, Februari*, vol. 2024, no. 3, pp. 261–266, 2024.