

ANALISIS PERENCANAAN JARINGAN *FIBER TO THE HOME* (FTTH) *UNDERGROUND* PADA PERUMAHAN EUNOIA LUXURY RESIDENCE

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ABSTRAK

Peningkatan kebutuhan akan layanan internet berkecepatan tinggi menuntut infrastruktur telekomunikasi yang andal sekaligus memenuhi aspek estetika lingkungan. Perumahan Eunoia Luxury Residence sebagai kawasan hunian modern memerlukan jaringan akses *broadband* yang stabil, namun penggunaan kabel udara dinilai kurang sesuai dari sisi estetika. Oleh karena itu, penelitian ini bertujuan untuk merancang dan menganalisis jaringan *Fiber To The Home* (FTTH) dengan sistem *underground* berbasis teknologi *Gigabit Passive Optical Network* (GPON). Perancangan topologi dan jalur jaringan dilakukan menggunakan *Google Earth Pro*, sedangkan analisis kinerja sistem dilakukan melalui simulasi menggunakan perangkat lunak *OptiSystem*. Evaluasi kelayakan jaringan mengacu pada standar ITU-T G.984, dengan parameter utama meliputi *Power Link Budget*, *Rise Time Budget*, dan *Bit Error Rate* (BER). Hasil perhitungan dan simulasi menunjukkan bahwa rancangan jaringan memenuhi seluruh kriteria kelayakan. Daya terima pada sisi pelanggan berada di atas ambang sensitivitas penerima, yaitu lebih besar dari -28 dBm. Nilai *Rise Time Budget* total sistem sebesar $0,2501$ ns, masih berada di bawah batas maksimum $0,2917$ ns untuk pengkodean NRZ. Selain itu, nilai *Bit Error Rate* (BER) yang diperoleh mencapai orde 10^{-41} , jauh lebih baik dibandingkan batas standar 10^{-10} . Berdasarkan hasil tersebut, dapat disimpulkan bahwa rancangan jaringan FTTH *underground* berbasis GPON di Perumahan Eunoia Luxury Residence layak untuk diimplementasikan secara teknis dan memenuhi standar kualitas layanan.

Kata Kunci: *Fiber To The Home* (FTTH); *Underground*; GPON; *Power Link Budget*; *Rise Time Budget*; *Bit Error Rate*.

**ANALYSIS OF UNDERGROUND FIBER TO THE HOME (FTTH)
NETWORK PLANNING AT EUNOIA LUXURY RESIDENCE**

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ABSTRACT

The increasing demand for high-speed internet services requires telecommunication infrastructures that are both reliable and aesthetically appropriate. Eunoia Luxury Residence, as a modern residential area, requires a stable broadband access network; however, the use of overhead cables is considered undesirable from an aesthetic perspective. Therefore, this study aims to design and analyze a Fiber To The Home (FTTH) network using an underground deployment system based on Gigabit Passive Optical Network (GPON) technology. The network topology and routing were designed using Google Earth Pro, while system performance was evaluated through simulation using OptiSystem software. The feasibility of the proposed network was assessed according to the ITU-T G.984 standard, based on key performance parameters including Power Link Budget, Rise Time Budget, and Bit Error Rate (BER). The results show that the proposed FTTH underground network satisfies all technical requirements. The received optical power at the customer side remains above the receiver sensitivity threshold of -28 dBm. The total Rise Time Budget of the system is 0.2501 ns, which is below the maximum allowable value of 0.2917 ns for NRZ encoding. In addition, the obtained Bit Error Rate (BER) reaches the order of 10^{-41} , which is significantly better than the standard requirement of 10^{-10} . These results indicate that the proposed GPON-based FTTH underground network for Eunoia Luxury Residence is technically feasible and capable of delivering high-quality broadband services.

Keywords: *Fiber To The Home (FTTH); Underground; GPON; Power Link Budget; Rise Time Budget; Bit Error Rate.*