

ABSTRAK

Perumahan Cibiru Asri RT 03 RW 17 menghadapi kendala infrastruktur jaringan akibat penarikan kabel *Point-to-Point* tidak terencana yang memicu redundansi, penumpukan kabel pada tiang, dan risiko degradasi sinyal. Penelitian ini bertujuan merancang arsitektur jaringan akses *Fiber to the Home* (FTTH) berbasis *Ethernet Passive Optical Network* (EPON) topologi *Point-to-Multipoint* (P2MP) untuk melayani 69 pelanggan (*Home Pass*) melalui 9 *Optical Distribution Point* (ODP), serta menganalisis kinerja *Quality of Service* (QoS) layanan *Triple Play* berbasis standar ETSI TR 101 329 TIPHON. Perancangan geospasial rute kabel dilakukan menggunakan Google Earth Pro dan divalidasi melalui perhitungan *Link Power Budget* (LPB), kemudian diimplementasikan dalam simulasi Cisco Packet Tracer menggunakan segmentasi VLAN dan *Differentiated Services* (DiffServ) untuk prioritas trafik. Hasil validasi fisik Skenario A menunjukkan nilai redaman total sebesar 18,965 dB dan daya terima (P_{rx}) sebesar -19,965 dBm, yang memenuhi standar kelayakan ITU-T G.984 dan PT Telkom (rentang -13 dBm hingga -27 dBm). Pengujian QoS pada kondisi beban puncak (*High Traffic* 69 ONU aktif secara bersamaan) membuktikan efektivitas metode DiffServ dalam mengamankan layanan VoIP pada kinerja optimal dengan rata-rata delay 12,75 ms, jitter 1,94 ms, dan packet loss 0,00% berkategori "Sangat Bagus". Layanan Video dan Data juga berjalan stabil dengan throughput mencapai 4534,01 kbps dan 1824,75 kbps berkategori "Baik". Dengan akumulasi indeks QoS melebihi ambang batas kelayakan (≥ 3), rancangan jaringan FTTH berbasis EPON ini dinyatakan sangat layak untuk diimplementasikan di Perumahan Cibiru Asri RT 03 RW 17.

Kata Kunci: FTTH, EPON, *Quality of Service*, *Triple Play*, TIPHON, Cisco Packet Tracer.



ABSTRACT

Perumahan Cibiru Asri RT 03 RW 17 faces network infrastructure constraints due to unplanned Point-to-Point cable installations, leading to redundancy, accumulation on distribution poles, and signal degradation risks. This study aims to design a Fiber to the Home (FTTH) access network architecture based on Ethernet Passive Optical Network (EPON) technology with a Point-to-Multipoint (P2MP) topology to serve 69 customers (Home Pass) across 9 Optical Distribution Points (ODPs), as well as to analyze the Quality of Service (QoS) performance of Triple Play services based on the ETSI TR 101 329 TIPHON standard. Geospatial cable route planning was conducted using Google Earth Pro and validated through Link Power Budget (LPB) calculations, then implemented in a Cisco Packet Tracer simulation utilizing VLAN segmentation and Differentiated Services (DiffServ) for traffic prioritization. Physical validation results for Scenario A show a total attenuation of 18.965 dB and a received power (P_{rx}) of -19.965 dBm, satisfying ITU-T G.984 and PT Telkom standards (range of -13 dBm to -27 dBm). QoS testing under peak load conditions (High Traffic with 69 active ONUs simultaneously) demonstrates the effectiveness of the DiffServ method in securing VoIP services at optimal performance, achieving an average delay of 12.75 ms, jitter of 1.94 ms, and packet loss of 0.00%, categorized as "Excellent". Video and Data services also operated smoothly with throughput reaching 4534.01 kbps and 1824.75 kbps, categorized as "Good". With the cumulative QoS index exceeding the feasibility threshold (≥ 3), this EPON-based FTTH network design is deemed highly feasible for implementation at Perumahan Cibiru Asri RT 03 RW 17.

Keywords: FTTH, EPON, Quality of Service, Triple Play, TIPHON, Cisco Packet Tracer.

