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A Novel Approach to Improve Triple Play Services Performance

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ABSTRACT: Triple Play services offer a formed solution that can support any no. of subscribers. It is a combined solution of data, voice and video services that supports to deploy facilities in a very cost effective manner improving the profitability and speeding up the network recovery. The most common manner of delivering these facilities is Digital Subscriber Line (DSL).The current version of DSL technology (VDSL2) is capable to obtain up to 100Mbps data transmission.This paper measures and enhances the broadband access network performance by utilizing VDSL2 and MDUs for the Triple Play services transmission. A simulation model utilizing QualNet and Riverbed modeler is offered to describe the services transmission over MDUs and VDSL2 technology.The results of simulation will prove the proposal solution feasibility as the suitable technology for distributing these facilities within buildings set which can be government or residential buildings. Providing high-quality video content is one of the latest and most requiring challenges faced by the IP.

KEYWORDS: Triple Play Services;MDU; VDSL2; FTTH; ADSL; WIMAX.

I. INTRODUCTION

Triple Play services offer a formed solution that can support any no. of subscribers. It is a combined solution of data, voice and video services that supports to utilize facilities in a very cost effective manner improving the profitability and speeding up the network recovery. The term "Triple Play service" covers a huge collection of voice, video, and data services, involving: Video telephony / IPTV, which is multicast video (T.V channel) / Video on Demand (VoD), which is unicast video / Voice over IP (VoIP) / Gaming / Internet access (HTTP, FTP traffic) / E-mail / etc. As a result, research analysis is concentrated on IPTV; believe that efficiently transferred video is the major challenge. Later, a brief survey of the two other services, i.e. data and VoIP are proceeded. The full package of this service involves: line rental and telephony with an integration of Internet access, VoD, IPTV, entertainment applications and, finally, cellular phones. In other words: Multiple devices, multiple services, but one network, with various vendor and one bill. It is a result of the significant changes the industry is undergoing, i.e. social changes, technological innovations, and new regulations.

Furthermore, In next generation Triple Play networks are able of linking wired and wireless users, and it is offering reliable and fast service, providing high bandwidth with high QoS, and decreased total service cost. Triple Play services are just not like traditional Internet services. Traditional Internet is "best-effort" facility. In that subscribers are not online simultaneously, but combining traffic from several subscribers increases network efficiency. On the other side, Triple Play involves real-time facilities, like voice and video. These types of services have limited end-to-end delay, bandwidth needs and jitter. If a real-time service faces packet loss or packet delaythe link is immediately discarded. From the above discussion it is obvious that network delivery architectures are needed for Triple Play services. Since, with the video service which involves VoD, IPTV and HDTV, things are not so evident. Subscribers may now require up to 20Mbps to fulfill their requirements. As a result, the Triple Play required a new type of delivery infrastructure architecture as can be depicted in Fig 1[13]. It will be helpful to achieve an idea of how technology suppliers attempt to address the multiservice challenges. Triple Play is assumed to become a "killer application" as soon as its needs are fulfilled and market matures enough to offer it in a low cost. Increasing revenues lead several big companies to enter to the IPTV fields.

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The most general technique of providing these facilities is Digital Subscriber Line (DSL), which is a broadband access technology making enable high-speed data transmissions over the available copper telephone wires ("local loops") that links user's offices orhomes to the local Central Offices. The current version of DSL technology (VDSL2) can obtain up to 100Mbps data transmission rates by utilizing modern signal modulation techniques. The requirement for bandwidth enabling subscriber applications is required to get increase more than a double in the next 5 years (from 20 Mbps today to 100 Mbps and more by 2015) an increase which is ensured by the historically realized grow at a CAGR (compound annual growth rate) of 20% for residential bandwidth consumption [1], [2]. Deploying VDSL2 will help the delivery of 100 Mbps per household today to users.

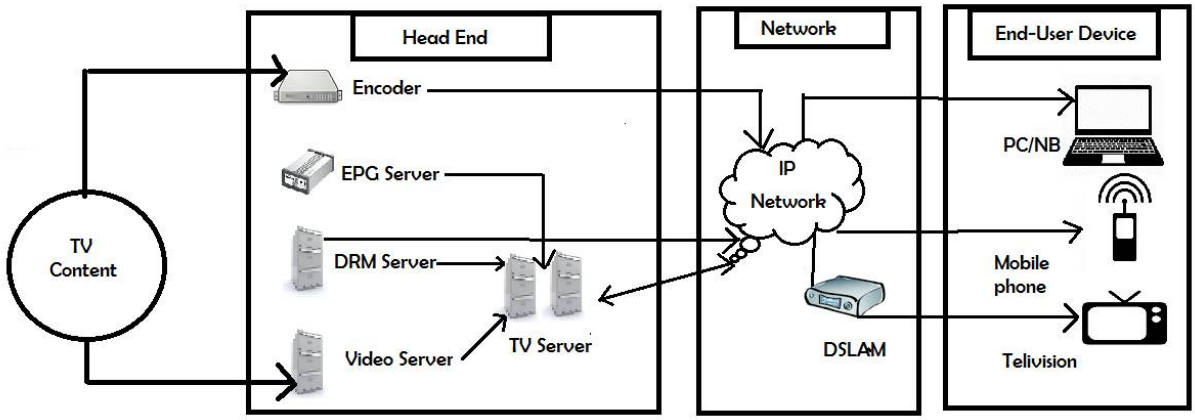

Fig 1 : IPTV system architecture

1.2 Functional Components of the Triple Play Services Architecture:

Content Sources - 'Content Sources' present a service that achieves video data from producers, and other sources, encode the data and, for VoD, save content in an acquisition database.

Service Nodes - The 'Service Nodes' represents a service that achieves video streams in various formats, then reformats and encapsulates them for transmission with appropriate Quality of Service (QoS) indications to the WAN for delivery to subscribers. Service Nodes communicate with the Customer Premises Equipment (CPE) for service management and with the IPTV service for the session, user and digital rights management. Service Nodes may be centralized or distributed in a metro area network (i.e. at the Central Offices).

Wide Area Distribution Networks– This provides the distribution ability, capacity, quality of service and other abilities such as multicast, necessary for the reliable and timely distribution of IPTV data streams from the Service Nodes to the Customer Premises. The access and Core Networks include the optical distribution backbone network and various Digital Subscriber Line Access Multiplexers (DSLAMs) located at the central office or remote distribution points.

Customer Access Links- Customer delivery of IPTV is provided over the existed loop plant and the phone lines to homes using the higher-speed DSL techniques such as ADSL2 and VDSL. The distance limitations and bandwidths obtainable for these DSL technologies are explained in Table 1. Service providers may use an integration of DSL and Fiber-to-the Curb (FTTC) techniques or implement direct Fiber-to-the-Home (FTTH) access depending on the abundance of their IPTV service provided.

Customer Premises Equipment (CPE)– Concerned to IPTV, the CPE device located at the customer premise provides the broadband network termination (B-NT) facility at a minimum, and may include other integrated functions such as routing gateway, set-up box and home networking abilities.

IPTV Client- The IPTV Client is the functional unit, which stops the IPTV traffic at the customerpremises. This is a device such as a set-top box, that performs the functional processing, which includes setting up the connection and QoS with the Service Node, channel change service, decoding the video streams, user display control, and connections to user appliances such as a standard-definition HDTV or TV monitors.

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II. LITERATURE REVIEW

M. A. Mohmed et.al.[1]; In this paper, writers examined QOS parameters that influence IPTV over WIMAX. For this writers utilized the RIVERBED Simulator tool for the simulation objective. Authors utilized QOS parameters i.e. packet end to end delay, Packet Delay Variation, traffic obtained (packets/sec) and traffic forwarded (packets/sec) according to coverage region and no. of IPTV links. Simulation results illustrated that WiMAX increased the no. of IPTV links and permits building of IPTV transmission anywhere.

A.Quadir et. al. [2];The PIM-SSM was configured by writers and QoS was enforced for tagged VLAN of multicast traffic. In their work, IPTV traffic in the Acreo testbed and research network was evaluated and examined by the writers. The ACREO IPTV source was utilized by the writers and distributed across the network. CISCO 3745 router was utilized for linking with ACREO IPTV network. Authors proposedsome recommendations for resilient IPTV facility, that were, for Multicast, utilize PIM-SSM for source specification characteristics, Utilize service VLAN to separate the multicast traffic, utilize a suitable network structure for resilient IPTV facility, Active equipment (routers/switches) should be configured appropriately.

Md. Hayder Ali et. al.[3]; In this paper, writers made a economical and technical comparison between GPON and Ethernet technology and presented the threshold analysis results between GPON and EP2P. Authors performed simulation by employingRIVERBED14.0. the results of Simulation presented that GPON Connectivity was more efficient as compared to Ethernet connectivity and possible to offer 7/8 GPON Connectivity by the Ethernet connectivity cost, EP2P solution had the network architecture more simpler as compared to GPON, because haven't any device between customers and central office. Also from the result, the EP2P network management is more easy that GPON as dynamic bandwidth assignment is not essential in EP2P. Also GPON has more infrastructure exploitation as compared to EP2P as the optical fiber connection is shared for the subscribers.

Benoit Hilt et. al.[4]; In this writers introduced to invert the joining and leaving operators to decrease zapping time utilizing IGMPV2 and IGMPV3 signalling. To remove the Channel Switching Delay, they introduced to change the channel switching scenario for every IGMP protocol version. With IGMPV3 protocol, they introduced to forward the single message to switch among channels. Several parameters were utilized by the writers for their simulation objective i.e. channel switch delay, Join latency, Channel surfing duration, Zipf exponent value, number of channels. According to writers simulation result, blackout time was decreased and their solution increased by 8% irrespective of the utilized IGMP version protocol. Their simulation also presented that channel overlapping was decreased when number of viewers increased.

Chhaya Dalela[5];Writer evaluated path loss and obtained a statistical path loss model for deployed WiMAX network that worked on 2.3 GHz frequency over a range of 100m to 3km. The Omni-directional antenna such as TW2.3/OMNI/8dBitransferring antenna was utilized. The transmitter and recipient were Tortoise dual-band transmitter and Coyote dual-band receiver, employed for experiment at 2.3 GHz. The average of 512 samples per second in spatial and temporal zone was done. A statistical path loss model depending on log-normal shadow fading for urban Indian atmosphere was shown. The model depended on a large no. of evaluated data sets achieved in the western India .The work provided valuable propagation evaluations for a frequency range that are increasingly being assigned for broadband wireless networks internationally.

III. MDU (MULTI DWELLING UNIT)

The American Housing Review also observes that there are over 32 million MDUs in the U.S. which is approx. 25 percent of all residential buildings. About one third of the over 32 million MDUs have two to four units, another third contains five to 19 units, while the final third are span from 20 to in excess of 50 units. MDUs show approx. 30 % of the total residential market for Fiber To The Home (FTTH). Thus, it is hard to be successful with FTTH in the residential market without a success-based scheme for MDUs. The first step in formulating that scheme includes understanding the MDUs owners. The people that have own MDU buildings (like the one presented to the right) are not enamoured with the modern FTTH technology. Their main interests remain with the economic metrics of rental duration, rental rates, turnover and occupancy levels. The telecom supplier must approach how FTTH translates into building those economic metrics enhance for an MDU owner. Do higher internet speeds translate into higher rental rates? If so, this would be a significant metric to share with owners of residential building. It can be a significant asset to the telecom supplier when negotiating access to the space for equipment and building. Furthermore, it is equally

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significant to represent the owners how FTTH as a service providing will surpass cable and satellite over time. MDUs are long-term assets where rehabilitation and upgrade expenses are a business normal part. This is significant to remember if surveying a building becomes essential to compete with satellite and cable. Now this could be a challenge for older buildings with full or poor cable duct plans. It should be observed that Gigabit services delivery across phone wires will be existed. These Fiber-to-the-building (FTTB) solutions will depend on the novel telecom standard known as G.fast. This permits FTTH networks to be explored within the MDU with the minimum amount of rewiring. Once the FTTH advantages have been grown for the building owners, a destined campaign to educate the MDU community is the second phase. Going after all markets in the initial FTTH rollout is not viable. It is wise to choose particular regions within single-family FTTH markets at the starting to validate the services, the solution, and costs related with supporting this unique market. This can often be done in conjunction with the single-family campaign in the region. In any case, work with the organizations (ex. “Broadband Communities”, etc.) in destined regions to educate the building owners on all the present and future FTTH advantages before you take any further action.

IV. VDSL2

VDSL2 is the novel and most modern standard of DSL broadband wire line communications, targeted to support the broad deployment of Triple Play services. It offers a very high-speed Internet access up to 100 Mbps. Another significant benefit that carriers obtain from the novel VDSL2 standard is interoperability with available products employing ADSL, VDSL and ADSL2+. Interoperability builds it easier and faster for carriers to start using VDSL2 networks and provide new broadband facilities. To increase bit rate over medium and short length loops, VDSL2 has been planned. To increase the bit rate utilize band between 12 and 30 MHz. VDSL2 is not just the VDSL successor; it can be realized as an emergence of both ADSL2+ and VDSL. The DSL technologies had offered the huge majority of users through copper wire pairs directly from the Central Office (CO) to the userlocation. While short line arrive of VDSL2 needs the huge majority of users to be provided through copper wire pairs running from the customer site to a closestnetwork node that is then connected to the central premises through radio or fibre. Thus, particularly in the Multi Dwelling Units (MDUs) space, VDSL2 can be a predicting technique for applications needing a very high bandwidth in the downstream direction towards the customer. Hence, this architecture could be shown as hybrid fiber-copper.

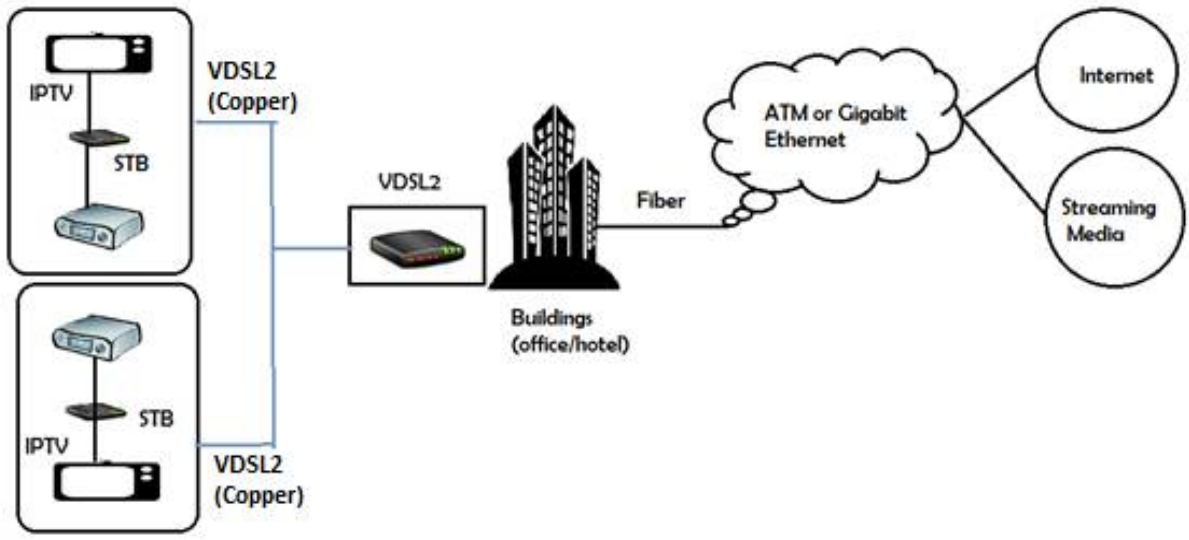

Fig 2 : IPTV and VDSL2

Thus, VDSL2 can be a favourable technique for applications needing a very high bandwidth in the downstream direction towards the user, particularly in the Multi Dwelling Units (MDUs) space [5]. For providing high bandwidth facilities for large buildings i.e. office tower, hotels, and apartments without the requirement for new infrastructure,

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VDSL2 is specifically helpful. It is also ideal for university campuses or business parks, where there is a short distance with neighbourhood cabinet that are connected by fibre optic to the exchange. Fibre links are complicated to install in places that needs twists and turns, by utilizing VDSL2 the short distances to every apartment can be covered [26].

V. SIMULATION METHODOLOGY

In this we improvement in WiMAX network using MDU and VDSL2 using QAM and QPSK modulation techniques and for simulation purpose we had taken RIVERBED Simulator. RIVERBED Simulator was used to analyze the performance of WiMAX for IPTV services. In these scenarios Subscriber is moving with different mobility patterns. In first scenario the mobility pattern of nodes is random and in second scenario the mobility pattern of nodes is along the trajectory. These scenarios are repeated for different modulation techniques (QAM, QPSK). To compare this SVC code is used. In our simulation we had taken 9Square cells. Each cell has a radius of 10 Km. In each cell there is one Base station and 20 mobile nodes. These nodes are circularly placed. The BS connected to the IP backbone via a SONET OC1 link. The server node is also connected to backbone using ppp-sonet-oct1 link.

VI. RESULTS

The figures 3, 4 and 5 show the Throughput of IPTV over Normal Scenario, Throughput of IPTV over Improved Scenario and Throughput Comparison of IPTV over Improved Scenario respectively. The result also represents that for 70 and 80 km/h, the packet end to end delay, the delay variation, load and delay has equal values. In future, one can examine the IPTV (VOD) over WiMAX by changing various parameters i.e. no. of mobile WiMAX users, network area and power. The average home requires in excess is 50 Mbps to fulfil today's entertainment and communication lifestyle, which is sometimes difficult to ensure even in cities, but more usually in the region with low-density infrastructure telecommunications networks.

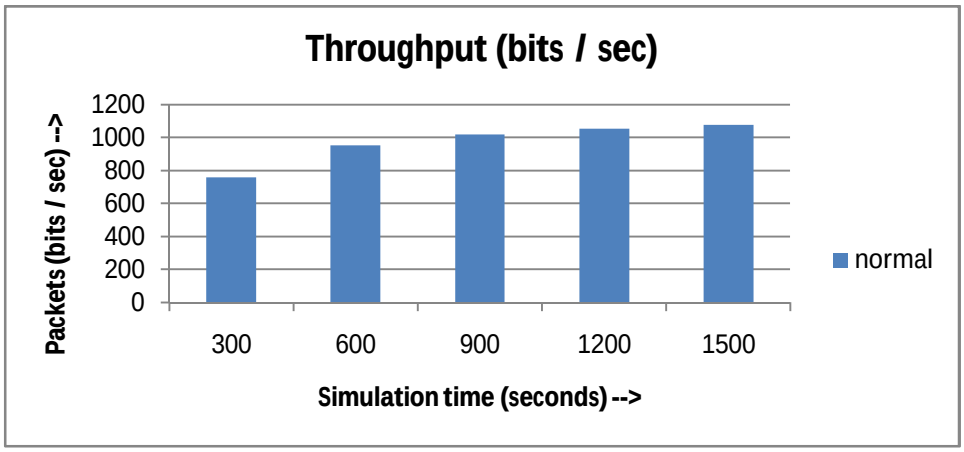

Fig 3 : Throughput of IPTV over Normal Scenario

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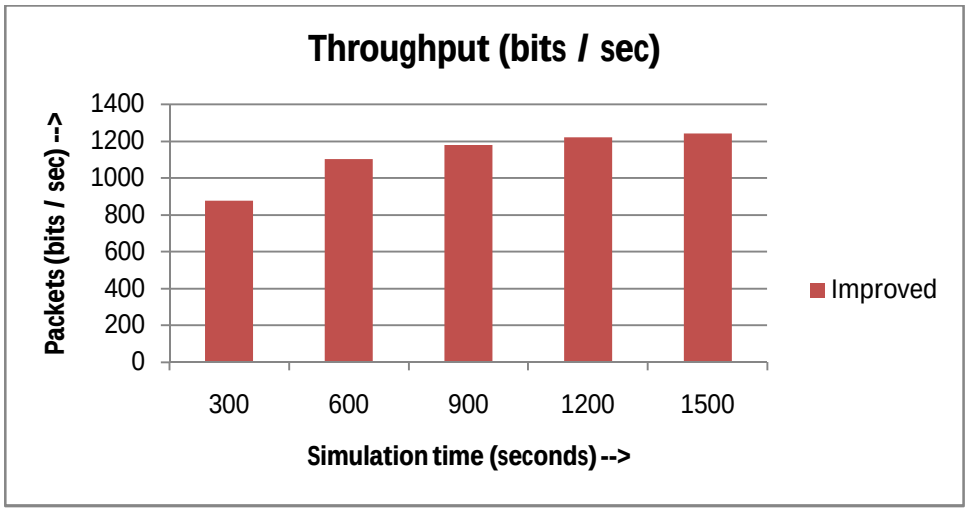

Fig 4: Throughput of IPTV over Improved Scenario

DSLAM must be positioned nearer to the users. This will build VDSL2 the best broadband access technique for campuses, Buildings Complex and Community multi dwelling unit (MDU) buildings by offering cost-efficient, reliable and easy deployment of Triple Play services involving; IPTV and improved video services (SD or HD). Second, just because it is an MDU does not mean you require an MDU Optical Network Terminal (ONT). Too usually telecom suppliers are attempting to fit a particular ONT type with a specific structure or customer. It is significant to remember that MDUs house residential subscribers. MDU ONTs are perfect for duplexes and four plexus. It is large apartment complexes, condominium and high rises that need an alternative solution for FTTH. Two of the preferred solutions are multi-service edge switches and micro ONTs.

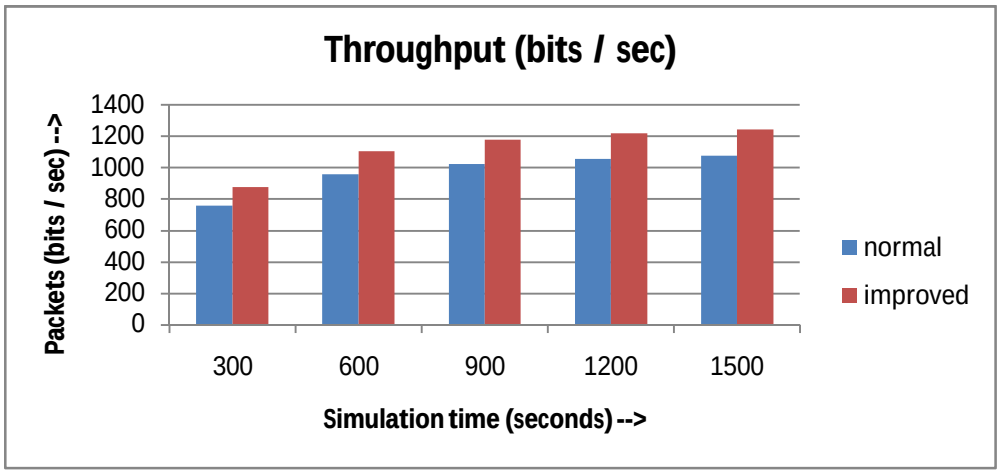

Fig 5 : Throughput Comparison of IPTV over Improved Scenario

VII. CONCLUSION

In this research, performance analysis of IPTV (VOD) over WiMAX by changing mobile WiMAX Subscriber mobility with respect to throughput is conducted. In this experiment the nodes placements are circular inside hexagonal cell of

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radius 10 km. Here every node speed is changing from 60 to 90 km/h. Simulation is conducted for three minutes. The results represent that with increase in the speed, packet delay variation, delay and packet end to end delay are reducing but the load is increasing, no doubt this load increment is very little. The result also represents that for 70 and 80 km/h, thepacket end to end delay, the delay variation, load and delay has equal values. In future, one can examine the IPTV (VOD) over integrated MANET and WiMAX by changing various parameters i.e. no. of mobile WiMAX users,network area and power. The average home requires in excess is 50 Mbps to fulfil today's entertainment and communication lifestyle, which is sometimes difficult to ensure even in cities, but more usually in the region with low-density infrastructure telecommunications networks, such as Iraq. DSLAM must be positioned nearer to the users. This will build VDSL2 the best broadband access technique for campuses, Buildings Complex and Community multi dwelling unit (MDU) buildings by offering cost-efficient, reliable and easy deployment of Triple Play services involving; IPTV and improved video services (SD or HD).Second, just because it is an MDU does not mean you require an MDU Optical Network Terminal (ONT). Too usually telecom suppliers are attempting to fit a particular ONT type with a specific structure or customer. It is significant to remember that MDUs house residential subscribers. MDU ONTs are perfect for duplexes and four plexes. It is large apartment complexes, condominium and high rises that need an alternative solution for FTTH. Two of the preferred solutions aremulti-service edge switches and micro ONTs. Micro ONTs provide various distinct benefits. The first, and perhaps the most significant is size. So small that they can fit in your hand palm, these devices are appropriate for MDUs.

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