International Journal of Latest Engineering Science (IJLES) E-ISSN: 2581-6659

DOI: 10.51386/25816659/ijles-v4i6p101

Volume: 04 Issue: 06 **November to December 2021** **www.ijlesjournal.org**

Commercial Opportunity to Institutions of Higher Education in Tanzania by Television Service Provision: A Proposed In-Hostel Power line Television Deployment Architecture

Thobius, Joseph

Department of Information Technology, Faculty of Science and Education

University of Iringa

P.O BOX 200, Iringa, Tanzania

Abstract *Entertainment, Education and Government news can be obtained by watching Television but with less lucky this service is hard to be accessed within academies hostels in Tanzania. Lack of suitable infrastructure is among reason for banning provision of such service within hostels. In-home powerline telecommunications technology enables delivery of communications and entertainments in every corner of households. This paper enlightens the uses of In-home powerline telecommunications and presents a designed infrastructure with minimal cost of installations for provision Television service within hostels in Tanzania. The architecture designed to use home electrical wiring for services distribution's to smart consumer electronics. The study recommends Television service as new business opportunity to academies.*

Keywords: *In-home Powerline Telecommunications, Universities, Television*

I. INTRODUCTION

Students whom are pleased with their hostels have higher chances on their academic performance [1]. This fact makes many universities students to compete to live in hostels but hostels owned by academies in Tanzania have tight regulations which obstruct running of several numbers of shelters based service to their customers. Unsupportive environments make warm showering, cooking and utilization of electric appliance such as fridges and Television (TV) to be among of banned services. The academies operate these hostels with less profit hence refurbishing them to incorporate number of recently home related services it is not a concerning. Advancements in housing technologies such as the connected Shower [2], smart shower [3], prepaid electric meter in Tanzania [4] and powerline communications in [5], [6] can facilitates the installations of business services to hostels with minimal cost and produce benevolent profits to academies institutions.

This study targeted television service among other available services to hostels in Tanzania. Television can be watched on a small handled mobile device's or TV screen's depends on situation or one preference. It includes pay and free TV service delivered via mobile phone networks, terrestrial television station or satellite broadcast. Downloading TV programs and podcasts [7] are among of current features available in TV services.

II. METHODOLOGY

The study investigate 30 academies hostels in Tanzania; 10 in Dodoma municipal, 5 in Iringa municipal, 5 in Morogoro municipal, 3 in Mbeya town and 7 in Dar es salaam and comes up with four major explanations for banning television service from hostels examined. First cause is electricity billing. Hostels fees paid by a student is not enough to compensate the total accommodation's billing per student which including paying water bill, electricity bill, security bill, cleaning service bill and yet remain with profits. Second reason comes from lack of suitable technologies in receiving TV signals directly to a student room. The investigation showed TV provision means, small satellite dishes and cable television were termed as environmental unfriendly by surveyed hostels administrative. Third reason was means of billing the TV service. The administrative explained if total cost will be shared some students will not manage to pay the fees due to economic issues and installing using fore mentioned methods such as cable per individual will results into maintenance problems as students are

DOI: 10.51386/25816659/ijles-v4i6p101

Volume: 04 Issue: 06 **November to December 2021** **www.ijlesjournal.org**

troublemakers one may decide to cut neighbour cables. In addition hostels surroundings are not in favour to install constellations of small dishes when satellite is an option. Last reason was the hostels building are old hence they lack suitable infrastructure to implement TV service, such as in example a safety way to trunk cables to each individual corner within a room.

This paper argues that due to the study survey then to enable easy market of TV service within hostels the cost of installation should be minimal as possible so that billing cost to students become fewer Shillings. The study comes up with three thoughts. Issue of electricity billing can be solved by installing prepaid smart electric meter [8]. Challenges of distributing TV signals within hostels can be solved by using in-home power line communications network [9], [11], [12] and a developed computer program. Stated in [4] and [10] that smart metering is strong method to grant access of service only when customer purchases and increase revenue collection. By passing TV signal through electric smart meter and broadband powerline communications adapters then there is means of controlling access of the service.

III. ARCHITECTURAL DESIGN

This architecture focuses only with satellite TV (SAT TV) and not Cable TV (CATV). With this architecture hostel's owner will allocate a single place for satellite dish installation and receiving and distributing satellite TV signals. This location will be in place where electricity smart meters for users are placed, by this study this location is named as distribution room. There are two cases for hostel room, one the room is occupied by single member and two when the room is shared. A shared room can consist of two members or four members and not often more than four members. In this study first case is assumed hence a single TV signal will be provided per room. The study architecture to enable provision of television service within hostels through below discussed components.

A. Quattro Low Noise Block (Quattro LNB)

It has advantage over Quad LNB because it does not need a satellite receiver to send a command to tune its signal bands, the band are already fixed during manufacturing process. Quattro had four output ports with different bands; horizontal polarized low band, horizontal polarized high band, vertical polarized low band and vertical polarized high band. These ports are designed to feed directly to satellite switches and not receivers.

B. Satellite Cascaded Multi-switch with 32 output ports or more

Satellite switches comes with many input/output ports number variations. The architecture suggest satellite switch with input of four or more and output of 32 ports or more. The four input ports are used to feed Quattro LNB while extra ports are normal for CATV connections. In each output port of the satellite switch, horizontal and vertical polarizations are provided. With this count of outputs ports from satellite switch, 32 users or receivers will be served. The satellite switches can be cascaded to 5 or 6 switches which make around 128 to 192 users or receivers to be controlled by single Quattro LNB and single satellite dish.

C. Electricity Smart Meter's

Each room will have its own electricity smart meter located in the distribution room. This meter's will connect and disconnect electricity to users based on currency unit. In Tanzania, Tanzania Electric Supply Company limited TANESCO is responsible for distributing, selling and installations of such meters. TANESCO has enabled to purchase smart meter currency unit through mobile telephone operators which reduce to bare bones controlling of user billing. TANESCO also has additional gadgets which allow user to recharge its smart meter within his/her room electricity socket without directly come in contact with smart meter. With these gadgets, distribution room will be safe and also hostels owner will not worry about billing of electricity from each room.

D. Satellite Receiver or Decoder

This will take input from satellite switch then feeds to the input of transmitting powerline communication adapter which is a sender adapter. The connection from decoder to powerline sender adapter can be Ethernet or High-Definition Multimedia Interface (HDMI). Many in-home satellite receivers come with High-Definition Multimedia Interface (HDMI). HDMI has higher transmission band therefore are not good to couple with electrical circuit when the distance from receiver to sender adapter is larger than 100 meter and also the distance from sender adapter and receiving adapter is more than 300 meter. In this case Ethernet feeding would add advantage's over distance limitation. The study will use Ethernet feeding to couple with user powerline circuit. Ethernet port will also allow programmable software within smart customer device's to manage the TV service in term of billing.

DOI: 10.51386/25816659/ijles-v4i6p101

Volume: 04 Issue: 06 November to December 2021 www.ijlesjournal.org

E. Powerline Communication Adapter's

Two powerline communication adapters will be used for each hostel rooms. One known as sender adapter will be located in distribution room and another one known as receiving adapter within individual's room. Sender adapter will accept Ethernet connection from satellite receiver's then coupling the signal to electrical circuit of a certain hostel room. Receiving adapter will be plugged to hostel room power outlet. The receiving adapter can use Ethernet port or Wi-Fi to connect to smart customer device. Receiving adapter must have built in power socket to avoid communications interference and duplication of power socket needs. An example of such powerline receiving adapter is shown below.

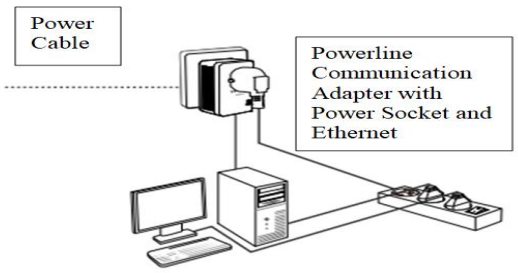

Fig 1: Receiving adapter with built-in power socket

F. Smart Customer Programmable Television Software

Smart customer device can be smart TV screen, smart phone, or computer or any device of which programmable TV software can be installed. Local Software should be developed based on smart customer platform to enable displaying of television and subscriptions services. The software should allow users to subscribe, to pay billing, and accessing his/ her account.

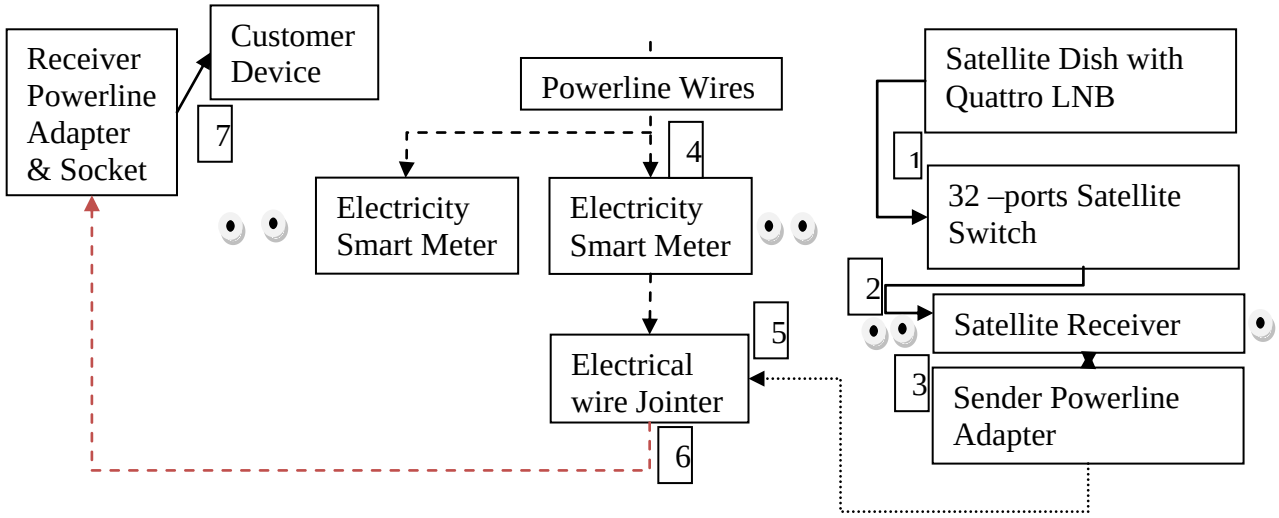

Fig 2: In-Hostel TV powerline service

Fig. 2 shows an example of in-hostel TV powerline architecture. First, TV satellite signals will be received by satellite dish with Quattro LNB. Output from Quattro LNB will be connected into satellite switch. The switches are cascaded to 5 or 6 switches. From each switch a connection is made to satellite receiver. Connection from satellite receiver is made to electrical wire jointer through sender powerline communications adapter. Electrical wire jointer takes in also a power cable from electricity smart meter. Wire from electrical wire jointer will go directly to the intended room whereby receiver powerline adapter is. User can connect normal devices or TV device from receiving powerline communications adapter. User can watch TV and performing subscriptions by using provided software. The academies will correct money from subscriptions from which they will be able to pay satellite dish subscriptions and remain with some profit, however some agreement should be made with satellite operators.

DOI: 10.51386/25816659/ijles-v4i6p101

Volume: 04 Issue: 06 **November to December 2021** **www.ijlesjournal.org**

IV. CONCLUSIONS

Academies should try several investments so that they can be freely of any uncertainty or increases income instead of depending mostly on student fees. Powerline communications will offer easy penetration of data, phone and TV business hence it is a promising business to academies as the fact that most of hostels are owned by them. In Tanzania-urban areas, electricity have been deployed to almost any house and hostels, hence utilization of powerline for communications it will be easy and will create another business opportunity and employment opportunities. For shared home or in hostels it is better to install standalone electrical wiring circuits for different customers and with smart electrical meters this process become easy. Manufacturing industries should also open their tastes and produce devices which assimilate several services such as for an example a satellite switch, receiver and powerline communication adapter and smart meter all can be a single device. This will reduce space and wiring. Further study may be made about programmable software of this presented architecture.

ACKNOWLEDGMENT

Authors hereby express the gratitude to all wardens and students whom granted private survey to their hostels. Vijana Lab Co. ltd is also acknowledged for their funds which used in the preparation of this paper. Gratitude should also goes to IT staff- University of Iringa, Iringa, Tanzania.

REFERENCES

[1] M. Uthuma, A. M. H. ali, "Impact Of Hostel Students' Satisfaction On Their Academic Performance In Sri Lankan Universities," *5th International Symposium 2015 – IntSym 2015,* SEUSL, 2015.

[2] K. Hyosun, F. Joel, F. Martin, C. James, "The Connected Shower: Studying Intimate Data in Everyday Life," *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies.* 2. 1-22. 10.1145/3287054, 2018

[3] Nadia Askar, "How Smart Tech is Changing the Bathroom," in *PHCC2018 Legislative Conference,* May, 2018.

[4] J. Veronica, R. Isha, "The prepaid electric meter: Rights, relationships and reification in Unguja, Tanzania,' *World Development*. 105. 10.1016/j.worlddev.2018.01.007, 2018.

[5] P. Mlynek, M. Rusz, L. Benesi, J. Slacik, P. Musil, "Possibilities of Broadband Power Line Communications for Smart Home and Smart Building Applications," *Sensors* 2021, 21, 240. https://doi.org/ 10.3390/s21010240, 2021.

[6] T. D. Farkas1, T. Király, T. Pardy, T. Rang, G. Rang, *Application Of Power Line Communication Technology In Street Lighting Control,* Int. J. of Design & Nature and Ecodynamics, 2018, Vol. 13, No. 2 176–186

[7] M. Al-rousan, A. Nawasrah, "Adaptive FEC Technique for Multimedia Applications Over the Internet", *Journal of emerging technologies in web intelligence,* 2012, Vol. 4, No. 2.

[8] S. David, "Effectiveness Of Pre-Paid Metering System In Revenue Collection: A Case Of Tanesco Meru District Arusha," B. Degree of Business Administration in Accounting, University of Arusha, Arusha, Tanzania, 2020.

[9] N. Silindile, M. Hippolyte, T. Alfredo, G.S.V.R.K. Rao, "Powerline networking as an alternative networking solution: a South African experience," *Power India Conference, 2006 IEEE,* 10.1109/POWERI.2006.1632490.

[10] *Prepayment Metering Solution in Tanzania,* EDMI, 2009

[11] H. Hrasnica, A. Haidine, R. Lehnert, *Broadband Powerline Communications Networks*, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England, 2004

[12] T. N. Le, W. Chin, D. K. Truong, T. H. Nguyen, Advanced Metering Infrastructure Based on Smart Meters in Smart Grid In Smart Metering Technology and Services - Inspirations for Energy Utilities, DOI: 10.5772/6363, 2016

[13] B. R. Amrutha, S. Vuddanti, S. R. Salkuti, 2021. "Review of Energy Management System Approaches in Microgrids" Energies 14, no. 17: 5459. https://doi.org/10.3390/en14175459

[14] J.F.H. van Agt, "Powerline carrier communications via low voltage networks," M. Eng. thesis, Eindhoven University of Technology, Netherlands, August. 2001.

[15] "Data Over Coax Gateway," Televes, Galicia, Spain.

[16] "AV500 Powerline Adapter With AC Pass Through," TP-LINK TECHNOLOGIES CO., LTD., Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China, 2012.

[17] "P200 200Mbps PowerLine Mini Adapter," Shenzhen Tenda Technology Co., Ltd., Zhongshanyuan Road, Nanshan District, Shenzhen China.

DOI: 10.51386/25816659/ijles-v4i6p101

Volume: 04 Issue: 06 **November to December 2021** **www.ijlesjournal.org**

[18] G. Horvat, Z. Balki´c, D. Žagar, "*Power Line Communication throughput analysis for use in last mile rural broadband,"* In Proceedings of the 2012 20th Telecommunications Forum (TELFOR), Belgrade, Serbia, pp. 245–248, 2012.

[19] F. Hashiesh, P. Soukal "*A proposed broadband power line communication system for smart grid applications in a typical egyptian network*," In Proceedings of the 17th Telecommunications Forum TELFOR, Belgrade, Serbia, 2020.

