

# COMPUTRONIX TECHNOLOGIES

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## Internet Connectivity with Fixed Wireless Access (FWA), Long Term Evolution (LTE) and Fiber Optic Cable Connection.

[4G FWA and 5G FWA, LTE and Fiber Optic: The trends]



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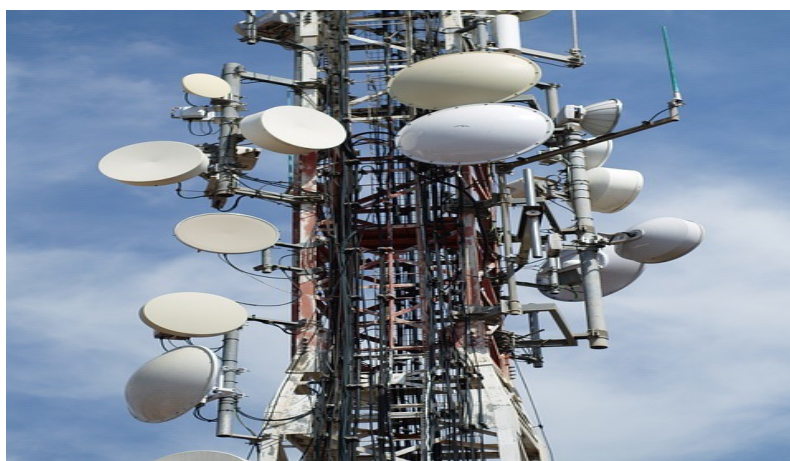
This paper is an evaluation and assessment of the merits and demerits of fixed wireless access, long term evolution and fiber optic internet connectivity including the advances made in fixed wireless access (FWA); like evolution of 4G FWA and 5G FWA. The paper draws an insight on how advances made in Fixed Wireless Access will be enhancing the business processes and operations in 21<sup>st</sup> century market.

## **FIXED WIRELESS ACCESS (FWA): WIRELESS TOWER**

More than 50% of the world population is still living without broadband internet and according to Huawei; more than 1.3 billion homes around the world do not yet have broadband internet connectivity. It is believed that fixed wireless access will address this issue of non-connectivity to broadband internet and serve those living in rural and remote regions of the world through the use of fixed wireless access(FWA).FWA is cheaper than fibre internet connectivity, DSL,VSAT.FWA has good ROI and a lower payback period of less than 2 years. These are established business case for FWA. It is also very scalable.

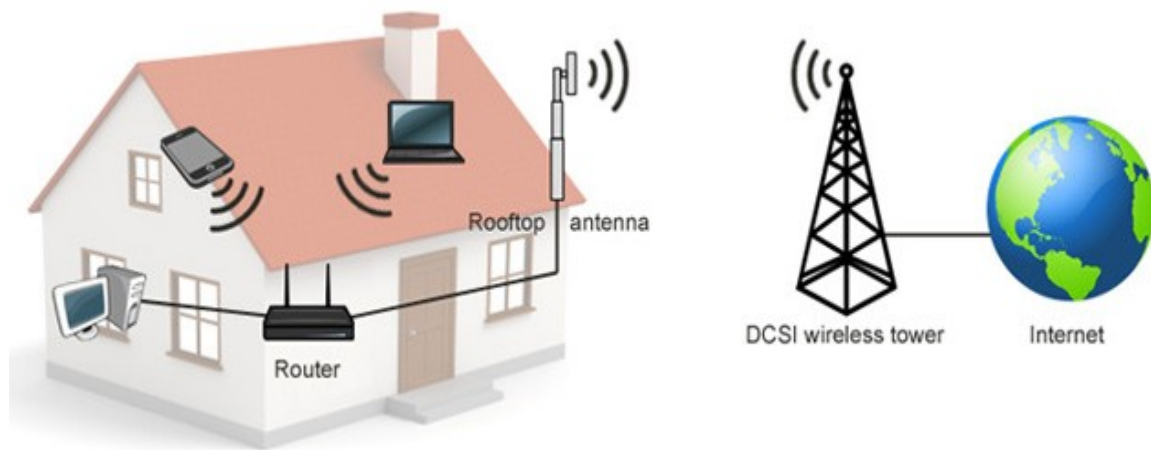
### **So, what is FWA?**

It is the established means of providing internet access to homes and businesses with the use of wireless mobile network technology instead of fixed lines between two fixed points. However, the performance of FWA is lower compared to fibre connection in the sense that it has a lower speed. We are looking at 5G network technology to boost performance of the next generation of FWA. Moreover, 5G FWA will hopefully grow by 84% by 2025 with a worth of over 40USD billion.5G FWA will be cheap and fast internet. The 5G FWA will require customer premise equipment (CPE) at the subscribers' home or office in order to access the wireless signals from the BTS of mobile network carrier or provider. It is 40% cheaper than fibre-optic internet connectivity.5G FWA performance will be similar to fibre broadband network in terms of data speeds.5G FWA will consume higher frequency band than 4G networks, such as 28Ghz with higher spectrum availability than LTE.



For 5G FWA, let it be noted that there will not be digging up of roads which fibre to the premises (FTTP) needs. It will grow businesses and made them more productive. It will serve urban and remote areas.FWA will bridge the gap in 'Digital Divides' in many countries of the world.FWA will create new opportunities for new entrants in the broadband market.FWA will accommodate the rising needs for IoT devices in the homes and business premises.FWA will reduce cost for the high civil

work needed in rolling out fixed broadband in large densely populated urban areas around the world. FWA has high throughput and latency. In Nigeria NCC has begun to offer frequency spectrum to mobile network operators for FWA. FWA requires only Base Transmission Station (BTS) and CPE installation, no need of civil work. Although DSL seems cheap, FWA will compete favourably by enabling low latency and high bandwidth. Radio innovative technologies such as MIMO with 3D beam forming aggressively slashes FWA cost by up to 81% when compared to wire line connections. High gain CPE antennas will make FWA have a comparable performance to fibre-optic connectivity, although there may be a cost increase in using high gain CPE. Many mobile network operators are already providing FWA on 4G LTE.



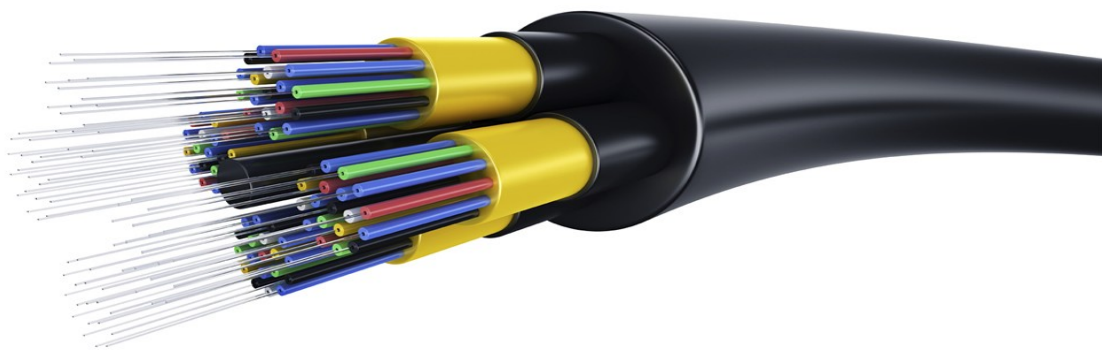
FWA can support VOIP. It is part of a wireless local area network (WLAN). FWA is a point-to-point (PTP) microwave signal transmissions from base station to CPE. It derives its electrical power from mains grid while mobile wireless are battery powered. FWA uses directional radio antenna, which are larger than the ones used in Wi-Fi setups. The antenna has to tolerate different forms of weather and covers signal distance and bandwidths; such antennas should have ability of narrowing the beam and concentrating transmit power to their destination, thereby enhancing reliability and data rejection (eavesdropping). This will make the link to improve on speed. Licensed frequencies for the FWA will also enhance speed and quality of service (QoS).

## FIBRE-OPTIC CONNECTIVITY

The future of broadband lies in fibre-optic internet. This is a broadband internet that uses fibre-optic technology in reaching the fastest speed of up to 10000Mbps. Fibre-optic communication takes place when a beam of light is sent through fibre-optic glass cables; thereby transferring information. Fibre Internet is powered by fibre optic technology. It at the helm of affairs right these days ahead of other internet

competitors due to numerous advantages it possesses. Its working principle and the challenges associated with it will be fully discussed.

The core and the cladding of optical fibre jointly work together to create total internal reflection; which entails the ability of light to move down the fibres without escaping. The pulses from fibre-optic cables carry binary data which goes on as binary code in the form of bites represented by 1 and 0. There are fibre-optic cables laid under the ocean floors to connect countries and continents for fast internet communication that carries voice, data and video. Optical network terminal (ONT) is always available for conversion of the light pulses into electrical Ethernet as soon as the pulses reach their destination. This light then connects consumers to the internet. Therefore, customers across the globe are connected to the web by internet backbone through a phenomenon known as "The Last Mile".



Fibre to the premise (FTTP), Fibre to the home (FTTH), Fibre to the businesses (FTTB) business or Fibre to the desktop (FTTD) desktop depicts the most common direct fibre lines; which delivers pure fibre to your residence without the need of copper cables. It is most expensive fibre connections for ISPs. In FTTB, Which means fibre to the building, which involves the spreading of the fibre line throughout the building? FTTC/FTTN/FTTS simply means Fibre to the cabinet/curb, neighbourhood, or street. These are the most popular type of fibre connectivity. Fibre infrastructure or wireless tower do not need electricity; this is positive fact for ecology; although it can be very expensive. DSL is environmentally and economically sustainable. The laid copper cables several years ago in most streets of developed countries for telephone lines facilitates internet connectivity these days because the laid copper cables are recycled and reused for creation of internet service; provided they are in good conditions. Fibre-optic internet is deficient in most rural areas. There is a gap here which needs to be filled by bringing fast internet service to rural community dwellers. Copper wires lose signal strength easily and can cause heat and fire. Fibre-optic cables are better against such effects copper offers. Owing a fibre-optic connectivity offers numerous advantages which include:

**Cost control:** DSL and cable connections costs are not better than fibre-optic because there other side costs linked to cable and DSL that fibre-optic do not have as it is a one-time installation cost that is involved. Also, if there a fibre user in your street or location, the installation cost will be greatly reduced. So, it remains cost effective to implement.

**Better Speed:** Fibre-optic is very fast in transmission of signals. The download and upload speed is quite better than other internet connectivity. You will be browsing the internet at super high speed. T-1 and DSL circuits typically transmit at 1.5 Mbps and 6 Mbps; implementing fibre-optic, will help you transmit at the speed of at least 10 Mbps. Choosing Fast Ethernet, will give you a speed of up to 100 Mbps, while selecting Gigabit Ethernet, you can connect at 1000 Mbps. You can reach 100GigE with fibre-optic, provided you have the right circuitry.

**High Bandwidth:** Fibre-optic connectivity has high bandwidth. You can increase your bandwidth in the range of 10/100/1000 Mbps, if your Ethernet port can accommodate such range.

**Connecting to Data Centre:** fibre connected circuits will enable your accessibility of remote servers. It will enable easy connection to cloud. Remote users will be connected as well after shutting down redundancies.

**Wi-Fi Easy Integration:** Allows easy connection wirelessly without customers experiencing slowdown provided the router has capabilities of accommodating gigabit speeds. So, fibre-optic can boost performance even when you are ure.ing Wi-Fi.

**No Hidden Charges:** Customers can only receive service charge for port and bandwidth. Another bill could arise from voice service; depending on whether a customer has voice service.

**Flexible Contract Terms:** fibre-optic connectivity has a contract term of 12months which allows the service provider to recover delivery cost. Project schedule could be shorter if there is fibre in the building of the subscriber.

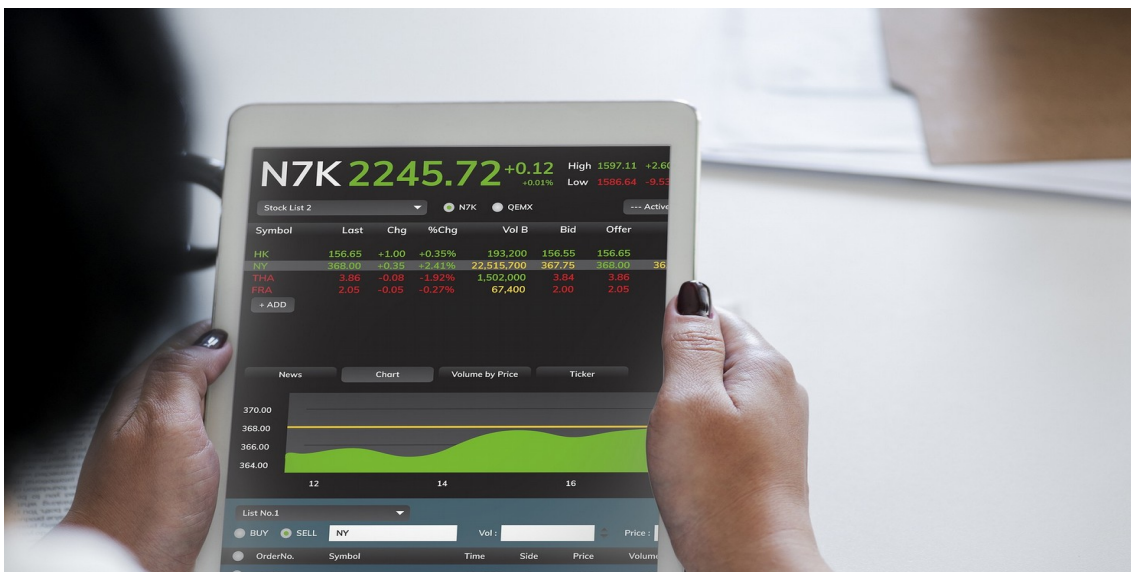
**No Need for Hardware Change:** Fibre-optic can be implemented even with aged computer hardware which can tolerate the super fast speeds. Fibre gives access to MAN (metro area network) through Ethernet.

## **LTE (LONG TERM EVOLUTION) NETWORK TECHNOLOGY**

Connecting your homes, offices, businesses, devices, friends and families at one static point and on-the-go with internet connectivity from Wireless devices and data terminals presently uses a standard known as long term evolution (LTE) for wireless broadband communication. LTE is based on GSM/EDGE and UMTS/HSPA technologies. It is a standard initiated by 3rd Generation Partnership Project (3GPP). We can call it an upgrade for carriers with GSM/UMTS and CDMA2000



networks. Most phones these days are LTE enabled. In marketing the network by mobile operators, the terms 4G LTE and Advance 4G is normally used as a marketing slogan even though it does not satisfy the technical criteria of a 4G wireless service. LTE can also be referred to as 3.95G. ITU decreed that LTE should be called True 4G in order to show distinction between them and LTE Advanced and WiMAX Advanced. There is now voice over LTE (VoLTE). As a result of the increasing demand for voice calls, LTE carriers introduced circuit switched fallback. This implies that LTE handsets revert back to 2G or 3G but works during the making and receiving of voice calls. LTE came to being in 2008 while Wi-Fi technology was introduced to the market in 1999 to provide wireless networking to computers and mobile devices using the 802.11a/b/g/n, otherwise known as 802.11a, 802.11b, 802.11g and 802.11n standards. LTE technology does not need a router to provide wireless network connectivity, but Wi-Fi standards need router before they can provide wireless networks.



## Speeds

LTE technology can give out speeds of up to 100 megabits per second (100Mbps) and 1Gbps while Wi-Fi standards transfer data between 11Mbps and 600Mbps. These speeds are subject to conditions like bad weather, network traffic and device capabilities. 4G LTE speed is faster than your home cable network; especially when your home is not located within the connected paths. 4G LTE wireless broadband is 10 times faster than 3G with download speeds between 5Mbps/12Mbps and upload speeds between 2Mbps/5Mbps.

## LTE & Wi-Fi Integration

LTE and Wi-Fi network connectivity can be integrated using a mobile router which allows any computing devices to connect to your wireless service provider's 4G network using Wi-Fi technology and LTE at each end. However, there is this WiMAX technology that is classified as LTE technology which is dependent on

802.16 Wi-Fi standard: It stretches the Wi-Fi wireless connectivity from 300ft to as much as 30miles.WiMAX is classified as LTE technology, but its connectivity relies on WiMAX-powered router rather than to a 4G network of a wireless service provider.

