



The Enhanced Community

Benefits of an All-Fiber Network

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INTRODUCTION

“ Bandwidth demand will soon outstrip current Fiber-To-The-Curb or cable capacity...while Fiber-To-The-Premises has room for growth ”

The growing popularity of advanced telecommunications and entertainment services is triggering a lively debate in the Multiple Dwelling Unit (MDU) industry – one with implications for MDU property owners and residents. As more residents demand access to advanced services, property owners must wrestle with how to best meet their residents’ needs. Property owners who do not respond to the growing need for more services face a potential loss of residents and profits, while those who embrace new technologies stand to be more competitive.

MDU residents want on-demand access to media and content directly from their home –mirroring the ever-growing market need for more bandwidth. Property owners face considerable pressure to deliver advanced services and upgrade their infrastructures. But many of today’s traditional coaxial infrastructures may not support the delivery of advanced services such as uncompressed high-definition channels or faster internet connections.

It is clear that MDU owners need new delivery options. The good news is that alternative solutions, such as fiber-optics (fiber), enable virtually unlimited bandwidth while eliminating the need for disruptive wiring upgrades. The bad news? Alarming barriers to free competition often prohibit consumers from accessing the latest video, data, and voice services – and prevent property owners from taking advantage of the flexibility of alternative solutions, such as fiber.

This white paper highlights a critical point – competition among providers ultimately benefits both property owners and residents by providing choice, critical infrastructure upgrades, and access to the latest telecommunications and entertainment services. Third-party industry experts and property managers support this position – and point toward an all-fiber network as the most effective solution for the ever-increasing bandwidth demands of MDU residents.



WHY BOTH PROPERTY OWNERS AND THEIR RESIDENTS NEED FIBER

Advanced services within a robust and dynamic market are creating new opportunities for property owners and their residents. Owners can leverage new technologies like fiber that extends all the way to the living unit - increasing bandwidth, property attractiveness, and ultimately property values.

The following section defines advanced services, explains the factors that are driving the demand for these services in MDUs, introduces the benefits of Fiber-To-The-Premises (FTTP) as a bandwidth-enhancing alternative to existing coaxial infrastructures, and explains why competition is good for owners and residents.

What are advanced telecommunications and entertainment services?

MDU residents, like the general population, are consuming more TV, internet and telephone services today than they did five years ago. Not long ago, basic cable TV with premium movie channels and a second phone line for dial-up met the in-home needs of most consumers. Now, MDU residents demand advanced telecommunications and entertainment services - in some cases ahead of the mass market. So, what do MDU residents want from these advanced services?

Access to state-of-the-art video capabilities, such as digital programming with an interactive TV guide, High Definition (HD) picture quality, and on-demand content including movies, TV shows, music, and games.

Better communication via sophisticated wire line communication services, including both traditional phone lines and VoIP (voice delivered over IP). They want expanded functionality, such as online call management, on-the-road/in-the-office portability, and click-to-call Yellow Pages search.

Broadband access to the Internet, which allows advanced games and music applications to run seamlessly alongside user-generated content - such as MySpace, YouTube, and the ever-growing range of photo sharing sites and remote digital content storage services.

Emerging services that enhance their lives, such as telemedicine, which allows physicians to monitor the health of their patients remotely, or premise surveillance, which empowers residents to monitor the security of their homes from the office.

In addition to advancements in individual products, technological innovation is also fueling the convergence of video, data and voice - creating a rich, interconnected multimedia world that affects the day-to-day lives of millions.

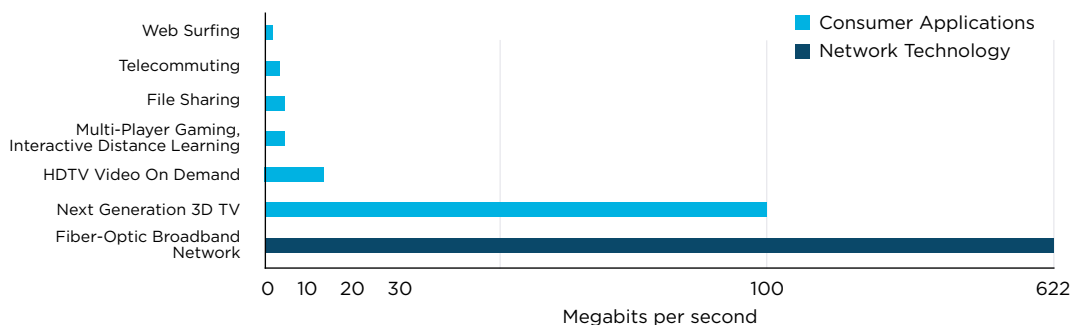
Imagine that your computer sends pictures and music to your TV, your Caller ID appears on your TV screen when the phone rings, your wireless phone can program your DVR to record your favorite show when you are not home, and your DVR-recorded shows can be viewed on any TV in your home.

As demand of advanced services by MDU residents soars and the availability of these services to MDU properties increases, existing communications infrastructures cannot keep pace. Furthermore, the needs for bandwidth, reliability, and a platform that can accommodate future innovations will continue to increase exponentially (see Exhibit 1).

Exhibit 1

Fiber-Optic Broadband Network Download Capacity

Source: Verizon Services Company





What factors are driving demand?

Three factors are driving consumer demand for bandwidth:

Access to Content

Consumers living in today's wired society demand constant access to high-speed wireline and wireless communications and media content. The increasing popularity of such services as Video-On-Demand or DVR enable consumers to access content at their convenience. We are seeing a shift in the distribution model of video content from purely via the TV to an increasingly larger amount of video content being offered on the internet (e.g. *Apple*, *Amazon*, and *Google*). The rise in telecommuting clearly bolsters the need for remote access. The number of Americans working remotely at least one day per month increased 63 percent, from 7.6 million in 2004 to 12.4 million in 2006,⁵ according to a "2007 *Telework Trendlines for 2006*" study by *WorldatWork* and *The Dieringer Research Group*. The ability to access one's personal and professional media, such as music or office files, from the home is becoming a standard requirement of modern living.

High Bandwidth Applications

Greater consumer needs are driving development of high-bandwidth applications such as photo-sharing websites, user-generated content networks, Internet video portals, downloadable movie destinations, and secure virtual private networks. These applications are rapidly supplementing, and for many consumers replacing traditional forms of entertainment and work products.

Advanced Consumer Electronics

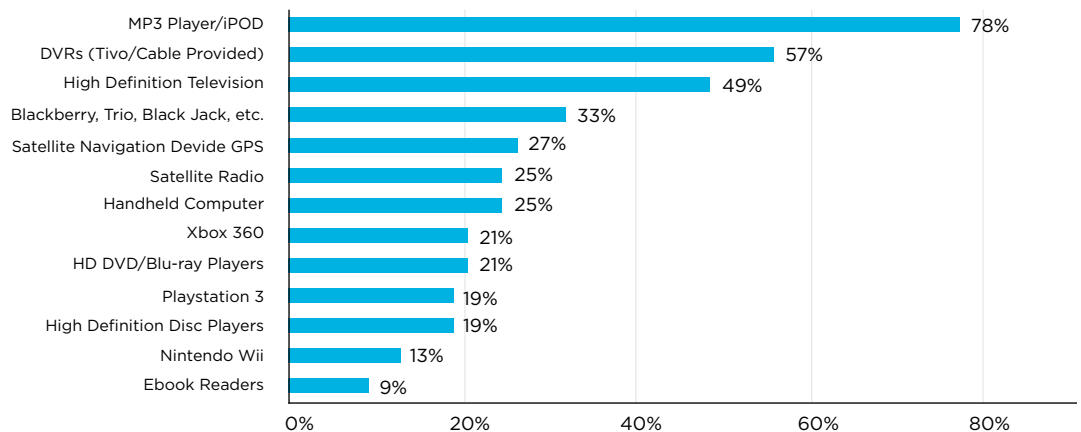
A slew of advanced consumer electronics are also driving bandwidth demand - including interactive high-definition television sets with VOD capabilities, new stereo systems that work with online music services, and gaming consoles that enable gamers to play against other gamers living next door or in other cities, are among the slew of advanced consumer electronics that are also driving bandwidth needs.

Recent growth in consumer electronics is staggering and is not slowing down. For example, *Praxis Research Partners*, a Connecticut-based market research firm, found that 57 percent of consumers in Verizon FiOS's footprint have a Digital Video Recorder (DVR), 49 percent own a high-definition television set, and 19 percent own a high-definition disc player (see Exhibit 2).⁶

Exhibit 2

Consumer Device Ownership in FiOS Footprint

Source: *Praxis Research Partners*





“ Having a choice of service providers was ranked in the top 5 among consumers...” ”

Why must property owners offer maximum bandwidth?

This type of demand increases residents' expectations for a reliable high-bandwidth network capable of delivering the entire portfolio of advanced services directly to the home. Consumers also want a network that enables them to share content between friends, family and co-workers.

This demand clearly impacts the consumer MDU segment. It is reasonable to expect that MDU resident demand for bandwidth is making access to advanced telecommunications and entertainment services a key factor in their selection of an MDU property. *Praxis Research Partners* found that:

“More than 50% of consumers exposed to a description of Verizon FiOS indicate that they would be more likely to purchase or rent a new home with this service, compared to an identical home without the service, everything else being equal.”⁸

As demand for advanced services grows, existing coaxial infrastructures are being stretched to the limit and becoming incapable of supporting these services. Although some cable companies are now considering bandwidth-expanding solutions of their existing coaxial networks (e.g. converting to all-digital systems using DOCSIS IPTV bypass and other solutions^a), cable companies still debate the cost-benefit impact of such technologies. Spencer Wang, Analyst at Beat Stearns, is quoted in the April 17th issue of *The Boston Globe* stating,

“We believe cable will need to manufacture incremental bandwidth over the medium to long term in order to remain competitive.....In the short term, the greatest concern is high definition TV...”¹⁴

Meanwhile, property owners must be able to offer the latest portfolio of advanced services or they risk losing residents. They can no longer afford to ignore new technologies like fiber, which have the potential of supporting the advanced services of today and those in the future.

Why is competition important to ensure a robust and dynamic market?

Consumers' access to advanced telecom services is crucial for a robust, dynamic market environment, which in turn can drive resident satisfaction, higher occupancy rates, rent premium and higher property value. *Praxis Research Partners'* study has found that “having a choice of service providers was ranked in the top 5 among consumers when asked what are the most important technology attributes related to home telephone, Internet and TV/video.”⁸

Committed, well-funded companies trying to serve rising demand for advanced services should not be obstructed by legal or physical roadblocks. However, some historical incumbents attempt to prevent providers with alternative solutions from entering the market.

Some cable companies appear to be blocking entry, preventing owners from offering advanced services and choice to residents. These incumbents persistently oppose video franchise grants to alternative providers and continue to enter into exclusive service arrangements designed to preclude the introduction of competition at the property level. Some claim ownership of in-building wiring and preclude other providers from having access to the wiring, even in cases when FCC Regulations require that the wiring be made available to the service provider selected by the resident. In still other cases, cable companies have placed locks on wiring terminals when Verizon began installing FiOS, or disconnected Verizon wiring serving Verizon FiOS TV customers.

The constant use of FUD tactics (Fear, Uncertainty, Doubt) by some providers impedes the emergence of a robust and dynamic market environment. Within the MDU segment, these actions hurt property owners by preventing fiber upgrades in buildings that could lead to higher rents, greater occupancy, and greater property value.

^a Comcast recently announced that by July 2007 it would convert Chicago to all-digital video distribution, from a combination of analog and digital service today, to accommodate bandwidth demand; DOCSIS IPTV bypass refers to a bandwidth-enhancing solution developed by Motorola. It allows cable companies to flexibly exploit the power of IP for TV services without incurring the costs of adding downstream processing capacity to the Cable Modem Termination System.



Why are competition and fiber good for owners?

Demand for advanced services and more bandwidth will steadily escalate due to technical innovation and a converging market. MDU residents will progressively seek access to telecommunications and entertainment services, as well as the freedom to select a communications provider of choice, when choosing their next apartment. Henry Pye, Assistant Vice President at *JPI Partners, LLC*, comments on the benefits of residents' access to advanced services,

"Critical to the success of any community is a comprehensive package of the best possible services and technologies. With regard to voice, video, and data services, our residents want a selection of the best possible providers and products; this inexorably includes Verizon's fiber-to-the-premises design and FiOS services."¹⁰

Open competition in the provision of advanced services to MDU residents is vital. Competition gives owners the choice to use an alternative means of service delivery, such as Fiber-To-The-Premises, a method that can substantially benefit owners. Properties become more attractive to residents, and owners can charge premium rents while maintaining high occupancy rates. Jack Linefsky, Director of Operations at *Value Companies, Inc.*, comments on the benefits of fiber,

"Presence of FiOS technology and products has undoubtedly increased the attractiveness of our properties to potential residents."¹²

The presence of fiber can also increase property values. A nationwide study by RVA Render & Associates, LLC, *"Fiber-to-the-Home and Advanced Broadband 2006"*, reported that both real estate developers and fiber customers indicate that adding fiber could increase the value of a nearly \$475,000 home on average by as much as one percent.⁶

When competition for advanced services is restricted, residents do not have access to newly developed services and incumbent video providers become complacent. Without competition, these incumbents have limited incentive to upgrade their infrastructures and offer new capabilities. Residents can only access sub-standard telecommunications and entertainment products. They move out, and owners may face the possibility of watching helplessly as prospective residents look elsewhere for their living needs. In short, when residents are denied choice and services, property owners suffer financially.



WHAT IS VERIZON FiOS?

Verizon's FiOS network technology replaces old copper with fiber wiring to provide advanced services, such as FiOS Internet and FiOS TV. Verizon describes FiOS as follows:⁴

Verizon FiOS is fiber-optic technology, which can bring unprecedented entertainment, information and communications right into residents' homes. Laser generated pulses of light delivered over hair thin strands of fiber can provide voice communications, high-speed data, and video all the way to the living unit.

Verizon is committed to deploying fiber all the way to the living unit as the most effective solution to satisfy the increasing demand for bandwidth. The company has committed \$23 billion for this purpose and has begun deploying its fiber network nationwide with six million of households passed in the beginning of 2007, and with an additional three million a year planned through 2010.

Customer benefits associated with FiOS span the entire product spectrum starting with an always-on broadband Internet access with current speeds of up to 50Mbps, and higher speeds of up to 100Mbps under development. With FiOS Internet, a 90-minute standard definition movie can be downloaded in about five minutes or less. FiOS also enables advanced video capabilities such as HD television picture, on-demand content of 8,000+ titles, Home Media Digital Video Recording (DVR) enabling customers to time-shift content by digitally storing their favorite shows that can play on any FiOS-enabled set-top box in the home, and access to 200+ digital channels of domestic and international programming. FiOS provides customers with the choice between traditional telephone and functionality-rich VoIP services.

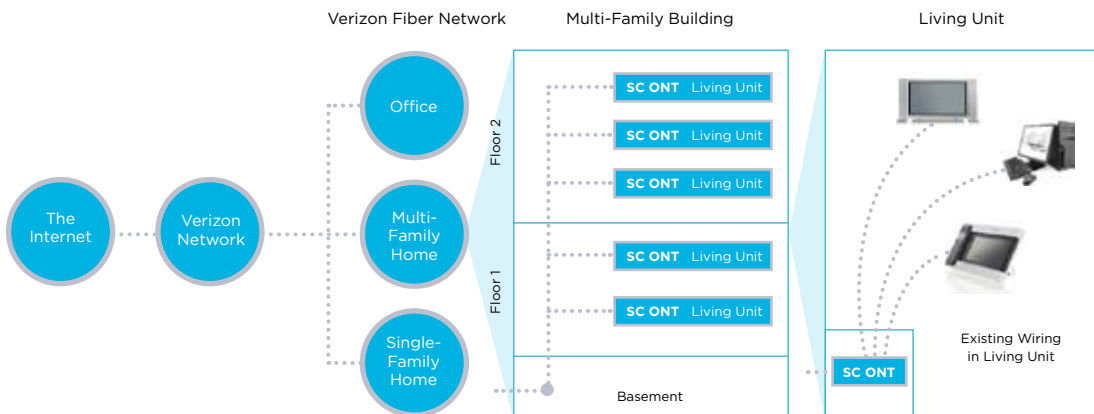


Why is fiber wiring and technology important and valuable to FiOS?

Strands of fiber optic wiring that carry content all the way to every living unit enable residents today to use and enjoy the most advanced telecommunications and entertainment services. FTTP's flexibility can minimize future disruptions that result from new and unanticipated services, products and applications. While some equipment might require upgrades to comply with requirements of new services, the fiber network deployed nationwide, and the cabling installed throughout the property, are designed to be flexible to support newly-developed high-bandwidth capabilities yet to come (see Exhibit 3).

Exhibit 3

Verizon Fiber-To-The Premises Solution



Fiber's bandwidth capabilities exceed those of copper infrastructures while maintaining high reliability of the overall network. Mark Wegleitner, Senior Vice President and Chief Technology Officer of Verizon Technology Organization says,

*"Fiber placed all the way to the living unit can support virtually unlimited bandwidth, relieving constraints in existing copper infrastructures and providing maximum flexibility for future service offerings."*¹³

This capability allows property owners to place the fiber infrastructure directly to the living unit while saving precious rentable space on every floor.

However, Verizon is committed to working with every property owner to accommodate their distinct building designs and their unique telecommunications and entertainment needs. The company offers an entire portfolio of fiber deployment solutions, such as the single-customer optical network terminal (SC ONT) or the multi-customer optical network terminal (MC ONT). Verizon designs deployment infrastructures that fit unique building designs and requirements while minimizing disruption. In addition to initial deployment, the company offers flexible and advantageous marketing contract arrangements that deliver both monetary and non-monetary benefits to property owners.



MARKETING CONTRACTS

“ Verizon’s marketing fees deliver comparable financial value...” ”

The terms of MDU marketing contracts are important to property owners who are particularly sensitive to the level of exclusivity and financial benefits within these contracts offered by service providers.

Owners can realize the benefits of FiOS by entering into flexible and financially beneficial marketing contracts with Verizon. These arrangements can provide property owners with monetary benefits in the form of door fees, bulk discounts on video and data services or residual fees received by the owner on a monthly basis. A competitive pricing study conducted by *Altman Vilandrie & Company* in January 2007 has found that Verizon’s marketing fees deliver comparable financial value to property owners relative to the competition.²

In addition to direct monetary benefits, Verizon MDU marketing contracts can allow owners to realize ancillary benefits associated with FiOS, including increased property attractiveness, higher occupancy rates, and growing rent premiums.

Verizon marketing contracts support Verizon’s objective of operating in a dynamic and competitive environment. The contracts do not prevent other voice, data and video providers from providing services to the residents, assuring that residents have the freedom to select their provider of choice. Verizon marketing agreements do, however, provide a mechanism to help residents learn about the advantages of FiOS, as well as an incentive for property owners to assist in the marketing of Verizon FiOS products to their residents. But most importantly, these contracts do not prevent residents from obtaining video, data or voice services from their provider of choice.

Some states have recognized the value of giving residents the freedom to choose their video provider, and have adopted mandatory access legislation. These laws prohibit exclusive provider agreements with regard to communications and entertainment services in an MDU property. The general rationale for the mandatory access legislation is that exclusive provider contracts inhibit the ability of MDU residents to have a choice of providers. Verizon’s marketing agreements are consistent with the mandatory access legislation, as they do not require property owners to enter into exclusive service arrangements.



IMPACT OF FIOS INSTALLATION ON PROPERTY OWNERS AND RESIDENTS

The aesthetic impact and disruption during and after construction are other important issues for owners, property managers, and residents. Verizon uses the latest construction and installation techniques to minimize resident-disruption during FTTP deployment in the property common areas and individual living units. For example, an exposed fiber path in the hallway may be concealed by a selection of molding styles. In addition, care is taken in the living unit to unobtrusively connect to the inside wiring.⁸

Fiber Installation Timeline

These techniques enable Verizon to deploy the FTTP architecture to an average existing property in a relatively short period of time, often within 60 to 120 days. In the case of Greenfield properties, Verizon works closely with developers and builders to ensure efficient deployment during the initial construction. Orrin Charm from *InfiniSys* and *Broadband Properties* reported on Greenfield FiOS deployment at JPI's Jefferson at Dedham Junction, 300-unit 8-building residential community in Massachusetts:

*"InfiniSys and JPI had less than two weeks to re-design, specify, and bid the FiOS upgrade, and commence construction to avoid impacting the overall construction schedule. The re-design and revised bids were completed within 10 days, and fiber ducts were installed by the 14th day."*¹

Henry Pye, JPI's Assistant Vice President is quoted in the June 2006 *Broadband Properties* issue saying:

*"Amazingly, working with the regional Verizon Outside Plant Engineering Team, InfiniSys and JPI were able to completely redesign, bid, negotiate, and execute the transition from a traditional POTS deployment to FiOS within 11 days."*¹

Jack Linefsky from *Value Companies, Inc.* comments on FiOS installation at one of his properties,

*"We worked closely with the installation crews. Residents were notified of the program in advance and again 24/48 hours before installation to their specific apartment. The ONT was installed in the closet and completed in about 1/2 hour. There was minimal disturbance to the residents."*¹²

Single-Customer vs. Multi-Customer ONT

Some owners questioned the need for the ONT to be installed in the living unit as opposed to elsewhere in the building. One of the clear advantages of installing a SC ONT in every living unit is that the fiber is also installed all the way to the living unit. This approach provides residents with virtually unlimited bandwidth capacity to enjoy the most advanced telecommunications and entertainment services, since the signal does not have to be transferred to coaxial or other copper wiring before reaching the living unit. It also preserves maximum flexibility to offer newly developed services to residents five or ten years in the future without ever again needing to touch the fiber in the walls.



In a MC-ONT installation scenario, the fiber signal is transferred to coaxial cable (if such cable is even available) in the basement or elsewhere in the building, modestly constraining the bandwidth before it reaches the living unit and potentially limiting future advanced services. For a summary of SC and MC ONT features, see Exhibit 4.

Exhibit 4

SC and MC ONT Feature Comparison

	SC ONT	MC ONT
Virtually unlimited bandwidth	●	
No distance limitation	●	
Flexibility to offer future services without replacing the wiring	●	
Located inside of the living unit	●	
Transfer of signal to coax before reaching the living unit		●
Battery back up	●	●
Enables residents' choice of service provider	●	●

The space and power requirements of a SC ONT are modest, requiring only 1.8 square feet of wall space and a standard 120V power plug. Verizon strives to place the SC ONT in locations that minimize the impact on living unit's look and design. Typical locations include utilities closets, bedroom closets and other low-impact areas.

Fire safety is another important issue for property owners, especially as it pertains to in-wall wiring. In a recent interview with Orrin Charm, Systems Architect at *InfiniSys Electronic Architects*, Charm says that,

"Fiber cabling and microduct must conform to and carry the same NEC Type or UL Fire Rating labels as copper cable. However, fiber does not carry electric current or conduct electricity, therefore it is immune to such issues as lightning, electrical interference, or power surges, and carries no danger of electric shock (unless the cable also has metallic components). On the other hand, since it is non-conductive, it cannot be used to ground the services at the ONT, as required by the NEC, so alternative grounding methods must be found."

Traditional copper cabling requires distance separation from electrical wiring to prevent fire hazard while the absence of electrical signal from fiber optic wire allows property owners to place fiber next to electrical wiring with minimal risk of electrical interference.

For properties with unique wiring topologies and designs, Verizon offers a range of alternative deployment solutions that do not require ONT placement in every living unit. Rather, for these properties, ONTs can be placed in common areas such as common floor wiring closets or the basement, and when possible, existing coaxial wiring is re-used from that point to the living unit. Although these MC ONT solutions are less potent in terms of bandwidth than the SC ONT solution, and do not offer as much flexibility for future services, the MC ONT maintains an acceptable quality of service and Verizon will install this solution upon the request of property owners. Property owners have final approval over design and deployment of any solution.



Installation Cost and Developing Technologies

Today, Verizon has decided to bear all deployment costs in existing properties located in areas where the company is deploying FiOS to single-family homes and businesses. As current policy stands, for any retrofit design, the owner does not have to incur any expense to have FiOS installed. Verizon pays for all equipment (wiring and ONTs) as well as for labor, and will work to achieve a timely installation. It cannot be assumed that this policy will remain in effect.

Finally, Verizon is continually developing new technology and installation techniques to further minimize the impact of fiber installation on property owners and their residents. These improvements include a 12-port MC ONT (to replace the existing 8-port MC ONT), which will allow 12 living units to be served by one piece of equipment. This approach should minimize the number of visits by Verizon engineers to manage in-building capacity and will also reduce the need for wall space. Another example is a SC ONT of the size of a small router which would replace the existing 1.8 square-foot SC ONT. Richard Holtz, CEO of *InfiniSys Electronic Architects* says that,

“MDU owners are very interested in providing the latest technology to their residents, especially a fiber rich offering such as Verizon’s FiOS triple play. They typically have full maintenance responsibility for their properties including the inside of the units where their residents live. As it is the nature of the industry, they must deal with a transient population and handle frequent move-ins and outs. Since space in apartments is typically limited when compared to a single family home they are very concerned about the installation of large pieces of equipment inside of the living unit or anything requiring frequent service like battery replacement. Owners are desirous of the enhancement that FiOS can bring to their properties as long as it does not adversely affect either their image or operating costs. Whether it is Greenfield (new build) or retrofit, FiOS can be an excellent solution to improve a property’s marketplace image as long as the Owner and the Verizon team are ready to work together, set their expectations early on, and then manage the design and installation process. The new smaller size ONT represents an ideal low cost retrofit solution for properties that have been designed to the InfiniSys FTTA™ standard over the last few years.”⁹

“ The new smaller size ONT represents an ideal low cost retrofit solution...” ”



MAINTENANCE AND SERVICE OF INSTALLED INFRASTRUCTURE

Fiber ONTs, like the cable company's set top boxes or cable modems, occasionally require maintenance. However, the ONT maintenance impact is modest.

The high reliability of the fiber network (when compared to copper networks) minimizes service outages and equipment breakdowns relative to all types of copper networks. This reduces the number of on-site maintenance and repair visits by Verizon engineers and technicians.

To avoid loss of functionality during power outages, SC and MC ONTs have battery backup that lasts up to four hours. An average battery's useful life is five years, therefore requiring occasional battery replacement. Verizon assumes responsibility for battery replacement in properties with multi-customer ONTs, but recognizes the disruptive impact of this activity on the residents in properties with single-customer ONTs located inside individual living units. Therefore, Verizon instructs property owners with SC ONT infrastructures to conduct battery replacement directly, enabling this activity to take place at convenient times for both owners and the residents.

A more reliable fiber network and flexible battery replacement procedures ensure that there will be fewer maintenance and repair visits to the property and the living units by Verizon engineers and technicians.



CONCLUSION

Technological innovation and rapid convergence are creating a market landscape in which consumer demand for advanced telecommunications and entertainment services and resulting need for bandwidth will not diminish. Rather, demand will climb for the foreseeable future. Access to advanced services, along with the freedom to select a provider of choice, increasingly will shape MDU dwellers' decisions when selecting a residence.

Open competition is imperative to enable property owners and residents to realize the true benefits of advanced services. More importantly, competition is critical to build a dynamic and robust marketplace in which property owners and residents have the fundamental right to choice.

Fiber-To-The-Premises technology opens new doors for owners and residents. Owners are enabled to offer cutting-edge telecommunications and entertainment services to residents, attract new tenants, charge premium rent while enjoying higher occupancy rates, and experience a boost in property values. Fiber is not only a solution for today – its adaptive capabilities will also help to protect initial investments and accommodate new technologies as they continue to come to market. Fiber is a future-ready solution with maximum flexibility to offer newly developed services five to ten years in the future – without touching the fiber in the walls.

Property owners have a unique opportunity to attract potential residents and satisfy the bandwidth demands of existing residents by adopting fiber solutions, while enjoying the monetary and non-monetary benefits of fiber for years to come.



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