

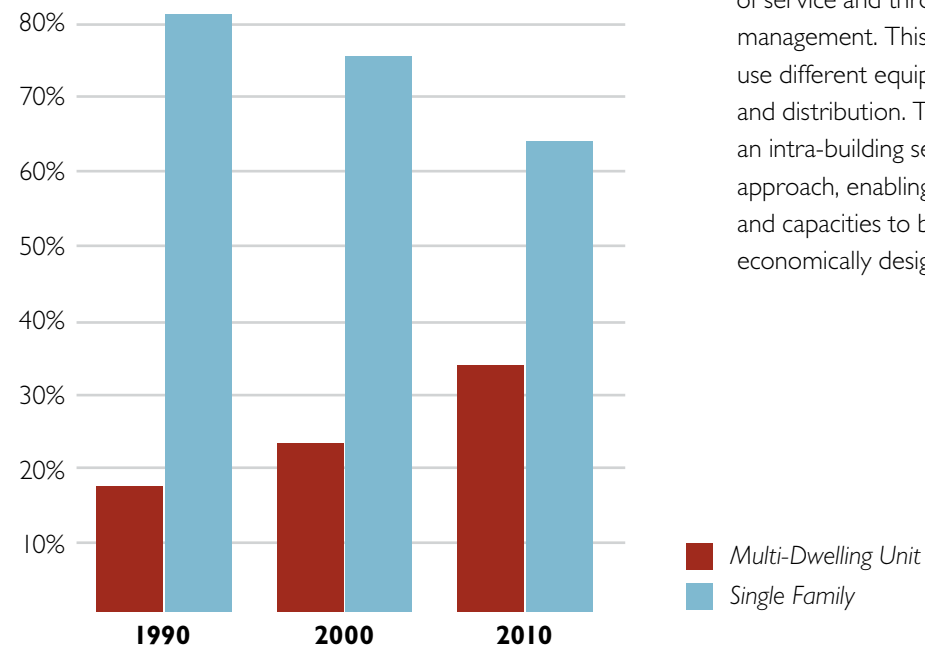
Capitalizing on MDU Services



The rise in home prices combined with lifestyle changes throughout the past ten years have spurred a rapid growth in Multi-Dwelling Unit (MDU) occupancy. The U.S. is quickly catching up with other parts of the world in the numbers of people living in MDUs. Today, more than a third of all U.S. residents live in MDUs, with an estimated five million MDU buildings ranging from garden-style condominiums and apartments to high rise condominiums, apartments and townhouses.

In recognition of the tremendous growth in MDUs many service providers are focusing on the delivery of residential broadband services, forming specialized MDU business units to sell facility-wide services to owners and residents. There is also recognition that the nature of MDUs are a unique environment, requiring specialized cabling and electronics for service distribution.

Percentage of single family and MDU living units in the U.S.



MDUs have unique needs

MDUs come in every size, age and variety. There may be a cluster complex consisting of multiple MDU buildings, or a single high rise with many floors. MDUs can range from a dozen units to hundreds of units, and in each type cabling and distribution varies by design and age. The access network and distribution for each type of MDU becomes its own unique network, thereby requiring a highly flexible and scalable platform approach for designing the right solution that is functionally and economically tailored to the need.

One of the most challenging aspects to MDU service deployment is inside wiring and distribution. There may be a Main Distribution Frame (MDF) in a telecommunication closet or basement, Intermediary Distribution Frames (IDFs) on each floor, riser cabling and different distribution wiring.

Regardless of the cabling and distribution used from MDU to MDU, the service provider must provide the same level of service and throughput, service quality and complete management. This becomes difficult if the service provider must use different equipment and vendors depending on location and distribution. The ideal solution is designing and building an intra-building service network using a common platform approach, enabling the service provider the choices in products and capacities to build a scalable and flexible solution that is economically designed to the need.

Allied Telesis is a global leader in MDUs

Allied Telesis is an IP network infrastructure company, pioneering Ethernet solutions since 1987. As a result, Allied Telesis offers advanced IP/Ethernet platforms with the right features and functions to enable managed delivery of voice, data and video services in every type of MDU application:

- POTS and VoIP (MGCP, SIP, H.323) voice services
- Symmetric and asymmetric HSIA over fiber and copper
- IPTV and RFTV video services

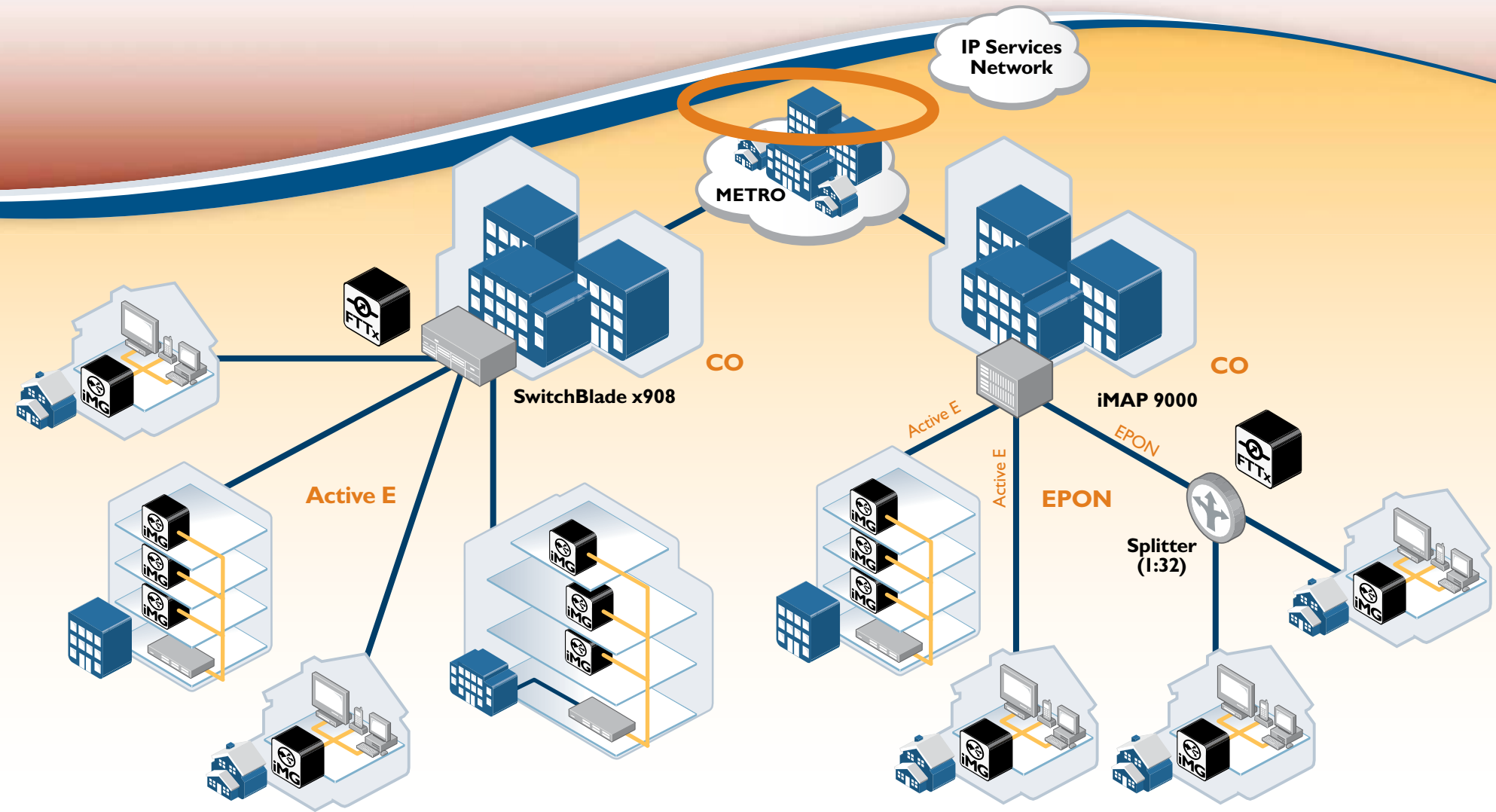
Allied Telesis is a global provider of IP/Ethernet access solutions. Allied Telesis carrier-class multi-service access platform, Layer 2 and 3 Ethernet switches, fiber and DSL home gateways, and media converters are deployed in every part of the world for MDU services. Allied Telesis has continually developed and enhanced its broad product portfolio through years of experience in delivering high quality broadband IP services in every type of MDU and service provider. Allied Telesis can be found in hospitals, college dormitories, military barracks and hotels as well as traditional apartment and condominium MDUs. The reason for Allied Telesis success lies in its breadth of technologies, offering end-to-end solutions, and a comprehensive management platform to support all of its products.

Today, with more than a quarter million MDU living units using Allied Telesis Active Ethernet fiber solutions, including universities, military bases, apartments and condominiums around the world, Allied Telesis has an unmatched track record in MDU systems and delivery of IP Triple Play.



Putting the Power of Fiber to Work

Allied Telesis multi-service access, switching and home gateways solutions support fiber-based services for the MDU market. The service provider may use one of several fiber approaches to MDU service delivery: Fiber-to-the-Building, Fiber-to-the-Floor, or Fiber-to-the-Premise. In each case, Allied Telesis has products and solutions to fit the need. Allowing the service provider flexibility to choose the location where fiber is terminated and a choice of distribution over intra-building cabling minimizes added work and expense for installation and materials.



Fiber-to-the-Building (FTTB)

In a FTTB application, fiber is fed from the service provider to the MDU, terminated at the switch or access system located at the Main Distribution Frame (MDF), often times located in a telephone room or basement within the building. Services to the living units are distributed over Ethernet cable (CAT5e) or the phone lines (DSL). The Allied Telesis portfolio of FTTB solutions supports a variety of features:

- 1G and 10G fiber fed connectivity
- 10G Ethernet Protection Switch Ring (EPSR+) options
- Ethernet distribution (10/100 TX, Fast Ethernet)
- Power over Ethernet (PoE) options
- Optical-to-Electrical (O/E) Media Converters
- Distribution at the MDF or fiber to IDF distribution options

Fiber-to-the-Floor (FTTF)

In a FTTF application, a hub switch is located at the MDF and is the interface to the service provider network. Fiber is fed in building risers to floors with an Intermediate Distribution Frame (IDF) where a smaller distribution switch is installed. The distribution switch distributed services to the living units on the floor via Ethernet cable or phone lines (DSL). Allied Telesis offers a wide range of distribution switch solutions for use at an IDF:

- 1G to 10G WAN, Fast Ethernet copper
- 8- to 48-port scalable capacity
- Power over Ethernet (PoE) options
- Media Converter options in lieu of switches
- Managed and unmanaged switches

Fiber-to-the-Premises (FTTP)

It is increasingly common for the service provider to bring fiber all the way to the living unit in an MDU. In the FTTP application, the access or switch is located at the MDF in the building, and fiber is laid to each living unit through the building riser and floor distribution, with a fiber distribution panel often located at the IDF. Within the premise, fiber is terminated on an intelligent service gateway/router, which provides multiple LAN connections, including 10/100TX Ethernet, FXS voice and, as an option, coax for RF video overlay. Allied Telesis offers a broad range of fixed form factor switches, stackable switches and multi-service access platforms designed for FTTP MDU applications, along with a family of feature-rich iMG fiber gateways for use in the premise.

- 1G and 10G fiber fed connectivity
- 10G Ethernet Protection Switch Ring (EPSR+) options
- 100 Mbps symmetrical Active Ethernet distribution
- EPON 1:32 split distribution
- 1G distribution
- Premise fiber gateways for voice, data and video service connectivity

Using a "building block" approach, Allied Telesis provides a comprehensive line of switching and access systems designed for use at the MDF or IDF inside an MDU. With a choice of models supporting a range of port densities, from 8 to 48 for example, the system used can be scaled to the needs of each building or floor for economic performance. There is a choice, too, of managed or unmanaged switches as needs dictate for intra-building distribution. Using the carrier-class iMAP™ access platform, options for EPON, VDSL2 and T1/E1 service applications in an MDU are available. Every Allied Telesis switch, access and CPE device is supported by AlliedView™ NMS, providing a unified management solution for MDU service needs across an entire building, campus or network — regardless of the choice or combination of products used:

- Managed Layer 2 and 3 switches
- Stackable Layer 2 and 3 switches
- Fixed form factor switches
- Chassis-based switches
- Multi-Service Access Platforms (carrier grade access)
- Service routers
- Fiber home gateways (iMG)
- Media converters

A Managed Services Solution for MDUs

Intelligent management translates to providing the service provider with tools to reduce test and turn-up time, to make service adds and changes quick and easy, and most importantly to maintain operational control over the network on a real-time basis. Allied Telesis products, supported by AlliedView NMS, do all of these — resulting in less down-time and more revenues and satisfied customers. The ability to remotely manage the intra-building MDU networks throughout a city or market from a central location saves hours of time and dispatch costs to diagnose and resolve problems that are often subscriber related and not network related. Having the same management and intelligence in both the switch/access node and service gateway extends control and service integrity all the way to the subscriber.

Coupling intelligent IP network elements that support Quality of Service (QoS), Class of Service (CoS), service prioritization and classification (DiffServ), IMGP multicast, along with advanced firewall and security functions with a management system that makes provisioning and management of these features simple is critical to managed services. Other enhancements such as one-touch (bulk) service provisioning saves time in service turn-up. With the growing complexity in enhanced IP services such as VoIP and IPTV, having a management system supporting intelligent access services platforms and service gateway terminals increases the level of services offered.

Choosing the right platform for MDU services

Protecting services from failure through hardware redundancy and environmental operating ranges is an important consideration. Both attributes come at additional hardware costs, and are therefore considered “optional” in many MDU deployments serving small numbers of customers. On the other hand, if high-revenue services are offered, those attributes may be strategically required. Allied Telesis recognizes that performance and economics both play an important role in decision making, thereby offering service providers a choice based on their needs.

Redundancy

Switch and iMAP access platforms are available with redundant and hot-swappable power supplies and fans in case of failure. The iMAP access platform additionally supports 1:n redundant uplinks and switch controllers. The range of options in switch and iMAP products means a service provider can choose how much or how little redundancy is required, offering economic scalability.

There are both switch and access options to use Ethernet Protection Switch Ring (EPSR+) on the 10G WAN side, which provides hitless sub-50 millisecond switching in the event of a fiber cut or failure. EPSR+ ring topology also supports sharing a fiber ring among a number of nodes in campus and neighborhood applications.

Hardware design

Since equipment is located inside a controlled environment in an MDU, special environmental requirements are less important than for equipment located in an outdoor cabinet or even a central office. All Allied Telesis switches and home gateways meet the environmental requirements for use in an MDU, as well as the required regulatory and safety certifications.

There are instances, however, where conditions are more severe and added environmental capabilities are needed. Access equipment in the iMAP series is designed and built as a carrier-grade platform, tested and certified for use in outdoor cabinets and central offices. The iMAP series offers hardened temperature operating ranges and extended EMI and ESD protection that comply with NEBS level 3 specifications.



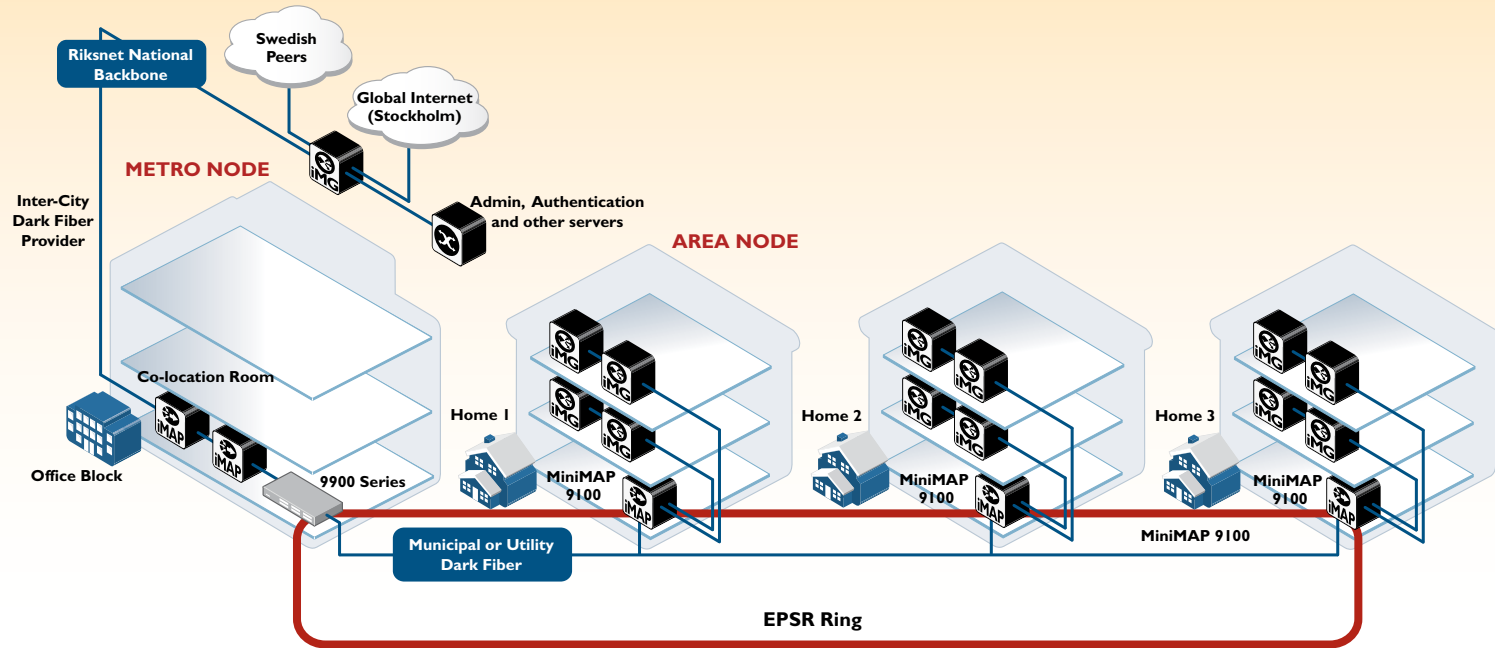
iMAP™ active fiber equipment installed at the MDF

Distribution over intra-building cabling

For intra-building distribution using 10/100 Ethernet or PoE, Allied Telesis Layer 2 and 3 switches offer unparalleled performance and economics. Switches provide options for 1G and 10G WAN connections, with some models additionally supporting EPSR+ ring protection. Switches are available in a fixed form factor, offering switch families with a range of ports based on models that can be stacked, along with chassis-based models that can be provisioned based on port needs. Switches are also offered that support Active Ethernet or 1G Ethernet for FTTP applications.

The iMAP 9000 series of multi-service carrier access platforms can be used for POTS as well as ADSL2+ or VDSL2 intra-building distribution over phone lines, along with Active Ethernet or 1G FTTP. All members of the iMAP 9000 family are chassis-based systems, enabling provisioning based on the card capacity of the chassis, the number of ports per card, as well as the flexibility to mix copper or fiber services in a chassis. The newest addition, iMAP 9810, supports 1G and 10G aggregation as well as service distribution.

Carrier Access



Carrier grade multi-service access provides a range of line cards supporting copper and fiber distribution within the MDU:

- Active Ethernet (100 Mbps, symmetrical)
- EPON (1.25 Gbps passively split bandwidth)
- Gigabit Ethernet (fiber or copper 1000T)
- VDSL2 (symmetrical or asymmetrical bandwidth over copper to 100 Mbps)
- POTS and/or SIP and MGCP voice (copper phone line)



iMAP™ 9000 Series of Multiservice Access Platforms

The iMAP supports fiber-to-the-premise with a 2-port EPON, 10- or 20-port Active Ethernet fiber, and an 8-port 1GbE card option. Both IG and IOG uplinks are available, with EPSR++ ring protection available for IOG uplinks. The iMAP 9000 family is designed from the ground up for Triple Play, and widely used for IPTV worldwide. It is a carrier-class, NEBS level 3 and temperature-hardened access platform built for deployments anywhere in the network: central office, outdoor cabinet, or MDU.



iMAP 9100

The iMAP 9100 is a 1RU chassis, supporting up to 3 line cards (fiber or copper), making it a scalable capacity model for use in small- and medium-density MDUs. The iMAP 9400 is a 3RU chassis with up to eight service slots, and has a capacity suitable for most small- to medium-sized MDUs. The iMAP 9700 is a 7RU, 17-slot chassis that provides capacity for larger MDU needs.

The iMAP solution for MDUs is primarily driven by the needs for capacity and redundancy/reliability when compared to switches. They are NEB3 compliant and temperature-hardened, using DC powering.



iMAP 9810

The latest addition to the iMAP Series, the iMAP 9810 is a 3RU, eight-slot chassis with a number of enhanced features and capabilities. It features a redundant design, with dual uplink modules, switch controllers and DC power units for increased reliability. The iMAP 9810 uses a new CFC100 switch controller, with a full 100 Gigabits switch fabric, increasing to 200 Gigabits when used redundantly. Each slot has a full 10 Gigabit throughput, offering non-blocking throughput at both the card and switch level. The iMAP 9810 supports all of the existing iMAP 9000 family service cards. It also features an all-new XE6 aggregation card with six 10 Gigabit ports. When used in tandem, the XE6 provides full wirespeed, 10 Gigabit aggregation independent of the switch controllers. The GE8 card with eight 1 Gigabit ports is similarly used for aggregation purposes, popular in MDU applications with subtending switches.

Layer 2 and 3 Fiber-Fed Ethernet Switches

Fiber-fed Ethernet switches are often the core technology used within an MDU for services. At the MDF, 1 Gigabit or 10 Gigabit fiber connectivity is provided, and the same connectivity can also be used for riser distribution to multiple floors. Layer 2 and 3 Ethernet switches support both copper and fiber subscriber service interfaces depending on model number:

- 10/100 TX and FE
- 10/100 PoE
- Active Ethernet fiber (100 Mbps symmetrical)
- Gigabit Ethernet fiber (1000 Mbps)



SwitchBlade™ SB-x908 Layer 3 Switch

One of the most advanced and flexible switches of its kind in the market, the x908 Layer 3 product features a modular design, with up to eight XEM expansion bays supporting options including 10 Gigabit, 10/100/1000 SFP or 10/100/1000 RJ-45 ports. Each expansion bay has 30 Gbps switching fabric. The expansion bays are hot swappable and the entire chassis can run on a single power supply unit (PSU) if needed. With VCStack™ software, multiple chassis can be stacked and managed as a single network element, significantly reducing complexity and diagnostics. It supports full Layer 3 IP functionality, including security, multicast and other functionality critical to managed service needs. Its low latency design ensures optimum performance for VoIP and real-time video type services.



x900 Advanced Layer 3 Ethernet Switches

The x900 switch series consists of 12-, 24- or 48-port models, including models offering expansion bay options with 30 Gbps switching fabric per bay. Different models support port options: 10/100TX, 10/100/1000T (including SFP model), Gigabit SFP and FE. The x900 offers both scalability and flexibility in MDU applications, either at the MDF or distributed IDF locations. As a fully featured Layer 3 switch, advanced functionality is embedded for IP Triple Play, VoIP, as well as security and QoS.



x600 Stackable Layer 3 Edge Switches

The x600 Series consists of five stackable models with different port densities and options. The options include: 10/100T, 10/100T with PoE, 10/100/1000T, and a 10/100/1000T with 4 x 1G SFP ports. A 10G uplink with EPSR ring protection is also available. These switches have high-level security functions like Network Access Control (NAC), often valuable in MDU applications, at the service entrance.



AT-8624PoE Switch

The 8624 Series Layer 3 switch with 24 10/100T PoE ports and dual uplinks has been widely adopted in MDU applications as a distribution switch at the IDF. Its compact design, coupled with PoE and number of ports, makes it a good economic choice for intra-building Ethernet distribution.



AT-9424T/POE Layer 3 Switch

The 9424 Series switch is similar in IP features and functions to the 8624PoE switch, except that it offers 24 10/100/1000 PoE ports and a 10G uplink. In small- to medium-sized MDUs, where distribution to living units can be done from a single MDF or wiring closet, the 9424T is often preferred.



AT-8000x Series Managed Ethernet Switches

The 8000 Series switches support Layer 2 functionality and represent a low-cost solution as either an MDU service platform in a wiring closet or at the IDF in multi-story buildings. This family includes choices of stackable 10/100 FE or 10/100/1000 PoE switches. The FE models have two combo ports and the 10/100/1000 models have four combo ports.

Intelligent Multiservice Gateways (iMG)

The iMG family of DSL and fiber (ONT) multiservice gateways incorporates the management and IP functionality provided in Allied Telesis iMAP™ access and Ethernet switching platforms, making them the ideal solution for terminating and connecting services within each living unit in an MDU.



iMG 616x Series of Indoor Fiber Gateways

The iMG 616/606x Series of Active Ethernet fiber home gateways incorporates the unique Allied Telesis two-piece clamshell design that enables a variety of mounting options. All models have 6 x 10/100TX Ethernet LAN ports, and are based on model 2 or 4 FXS voice ports. Other options include RF overlay, should analog or digital cable TV be desired, IGMP multicast for IPTV and 802.11 b/g wireless. All models are fully featured for Triple Play functionality including VoIP, along with security, QoS and other IP functionality.

- AT-iMG606BD
Active Ethernet Fiber intelligent Multiservice Gateway. Optimized Ethernet service delivery with routing and multicast support for 6 LAN ports.
- AT-iMG616BD
Active Ethernet single fiber based intelligent Multiservice Gateway with FXS x 2 ports and 10/100Tx LAN x 6 ports.
- AT-iMG616LH
Active Ethernet fiber based intelligent Multiservice Gateway with FXS x 2 ports and 10/100Tx LAN x 6 ports.
- AT-iMG616SRF+
Active ethernet fiber and RF video intelligent Multiservice Gateway with FXS x 2 ports and 10/100Tx LAN x 6 ports.
- AT-iMG616W
Active Ethernet single fiber based intelligent Multiservice Gateway with FXS x 2 ports, 10/100Tx LAN x 6 ports and 802.11bg Wireless interface.



iMG 7x6 MOD Outdoor Fiber ONTs

The iMG 7x6 Series of outdoor fiber gateways are designed for environmentally secured enclosures, and, while intended primarily for single-family residences, are also used for garden-style MDUs or in small-cluster MDU units like townhomes where each living unit is separately served. Among its many features, the iMG7x6 MOD offers selectable Active Ethernet, Gigabit Ethernet or EPON WAN modules, as well as an optional module to deliver HPNAv3 or 3.1 (Ethernet over coax) to the living unit for IPTV, using existing cable coax distribution. The iMG 7x6 MOD has POTS and VoIP ports, designed to connect outside the living unit at the Telco interface (NID).

- AT-iMG726MOD
*2 x FXS POTS or VoIP ports
6 x 10/100TX data ports*
- AT-746MOD
*4 x FXS POTS or VoIP ports
6 x 10/100TX ports*



iMG 801 Series VDSL2 Bridges & Routers

VDSL2 is often chosen for MDU applications in order to leverage the availability of existing phone lines to deliver ultra-high bandwidth DSL for Triple Play.

- AT-iMG801-10
*VDSL2+ with fallback to ADSL2+, Annex A
LAN 1 x 10/100 TX
Support profile 17a (50M/10M)*
- AT-iMG804-10
*VDSL2+ with fallback to ADSL2+, Annex A
LAN 4 x 10/100 TX
Support profile 17a (50M/10M)*

Wireless Ethernet Access Points



The AT-WR2304N wireless access point with 802.11n is a cost-effective MDU solution to provide broadband HSIA within a residence or in common areas within a MDU complex. Standard 10/100 Ethernet from the Ethernet switch located at either the MDF or IDF in the building connects wireless access points installed in hallways, rooms or common areas.

Media Converters



The Allied Telesis Convertheon™ line of managed media converters supports a variety of fiber-to-copper media conversion applications. Highly scalable, media converters are an alternative to subtending switches on each floor for FTTB applications when density is low. The most common application is optical-to-electrical (O/E) conversion to use VDSL over phone wires in MDUs.

Network Management

Often overlooked is the tremendous value an end-to-end network management system (NMS) brings to a service provider delivering MDU Triple Play. With access to residences often limited or difficult to schedule, the ability to provision, upgrade and diagnose services from a powerful management tool represents significant cost-savings. In apartments, where turnover is high, the frequency in which services must be activated, canceled, changed or upgraded is high, again requiring a management system enabling rapid reconfiguration. In many cases, a service provider is delivering services to more than one MDU in a market, and may use a variety of switches and multi-service access platforms depending on location and type of building. This, too, requires a comprehensive management approach to provide uniform services and diagnostics across a large subscriber base.

With AlliedView™ NMS, Allied Telesis provides a unified management approach, supporting Layer 2 and 3 switches, iMAP™ multi-service access and iMG fiber and DSL gateways under a single, intelligent umbrella. AlliedView NMS enables the intelligent network element to become a fully managed service network. With a user-friendly graphical user interface and CLI combined, AlliedView NMS supports provisioning, performance monitoring, diagnostics and troubleshooting, as well as restoration and upgrading for Allied Telesis products from a central or remote site. It features enhancements such as One-Touch Provisioning that allow a service profile for voice, data or video to be pre-assigned and applied across a number of subscriber lines to provide rapid service turn up and activation through bulk provisioning templates. It also provides complete inventory management, keeping track of every element in the MDU, including serial number of software level.

Fulfilling MDU service requirements is a matter of leveraging the right technology for the need in the most economic manner. Regardless of the type of media or equipment required in an MDU, the services delivered must remain consistent to every subscriber. The complexity is greatly reduced when there is a choice of products that enable a “building block” approach to MDU service delivery, while at the same time providing uniformity in features, functions and management. There is no “one solution” right for every MDU, but there is one solutions vendor with the right solution — Allied Telesis.



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