white paper

IPTV Deployment Options

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Overview

This paper outlines several scenarios in which a HomePlug® powerline network solution from Asoka can provide a simple, secure, and reliable means of delivering video services such as IPTV throughout a home or office using existing electrical wiring.

Asoka offers the simplest and most complete solution for delivering IPTV to any room within a home or office using ordinary electrical wires. Asoka's PlugLink® family of HomePlug-certified powerline networking products (PLN) is truly plug-and-play, turning any electrical outlet into a network connection without the need to install drivers or other software.

Why Choose Asoka?

Asoka's PlugLink AV products use HomePlug (PLC) AV technology to provide whole home network connectivity and deliver quick, predictable broadband-based service deployment using existing electrical wiring. Asoka also offers PlugLink AV products that use COAX cabling to provide maximum deployment flexibility. When deploying IPTV services, there are critical dependencies that Asoka's products address:

1. **Performance** – When delivering SD or HD streams to multiple set-top boxes (STBs) throughout the home, the delivery technology must be capable of supporting high throughput with a minimal amount of delay and packet loss. Asoka's PlugLink AV family of products can deliver up to 65 Mbps worth of reliable UDP throughput over a power line segment in a home. Though this is a near perfect case with little attenuation and noise, Asoka has found that ninety percent of the power line segments in a home can deliver more than 40Mpbs worth of UDP throughput. This much bandwidth will easily support typical TV service delivery of one HD stream and two streams of SD, with bandwidth to spare for Internet service or additional STBs. In the case of Asoka PlugLink AV over COAX, up to 90 Mbps worth of UDP throughput can be delivered over a given COAX segment. Because COAX is a cleaner medium (limited to no noisy devices on a COAX segment) and can be deployed at longer lengths (3dB loss for every 100 feet of cable), higher throughputs can be obtained. But because not every home has COAX in the desired STB location, this is typically viewed as a secondary HomePlug deployment option for IPTV.

2. **Ease of installation** – Asoka PlugLink AV products require no configuration. Installation of Asoka PlugLink AV products is as easy as plugging in a hair dryer. In the case of IPTV, the STB is plugged into the Ethernet port of the Asoka PlugLink AV adapter and the adapter is then plugged into the wall. At the point of broadband entry, the same cable procedure is performed. The broadband modem is plugged into the Asoka PlugLink AV adapter and the adapter is then plugged into the wall. To ensure ease of deployment, Asoka pre-configures products with the service provider's specifications for parameters such as QoS, bandwidth, and LED color/behavior. This ensures a clean, easy installation every time.

3. **Effortless, rock-solid security** – Asoka PlugLink AV products feature "push button security," which establishes secure communications over the powerline network with the simple push of a button on the adapter. By pressing a button on an existing PlugLink AV adapter and an adapter to be added to the network, the two adapters pair with each other, exchange security keys, and establish a unique, secure connection. No computers or software are needed to set up a secure network in seconds. PlugLink AV adapters use advanced 128-bit AES encryption and powerful network keys to prevent

unauthorized access to the powerline network from other adapters plugged into outlets inside or outside the home.

4. **Increasing the number of installs per day** – A key deployment challenge that service providers face is minimizing the amount of time it takes for each IPTV installation. On average, installers who use CAT5 as the delivery medium are able to do less than one IPTV installation per day. Though this can be due to multiple factors, the key one is inside wiring. Asoka PlugLink AV products turn hours of wiring into minutes of plugging.

5. **Testing** – Because HomePlug AV technology runs over a shared electrical medium, there will be cases where a given powerline segment cannot support the required performance for IPTV service. This can be due to factors such as excessively noisy devices nearby or length/quality of electrical wiring on the segment. It is difficult, with the standard set of tools that an IPTV installer carries, to determine when this is going to be the case. To address this challenge, Asoka offers the PlugLink AV 8060 Performance Network Tester. This specialized tool allows an installer to test a given powerline segment or segments in a home for the required performance (TCP/UDP throughput, packet loss, jitter) in a number of minutes. The installer can then get a quick view of performance before making the decision to use a different medium such as CAT5 for one or more segments or proceed to troubleshoot the powerline (unplug/move noisy devices, etc.).

6. **Deployment predictability** – Asoka is the leader in the carrier market space for HomePlug technology. With experience gained in some of the largest networks worldwide (PCCW, Bell Canada, Comcast, SBC, and many others), Asoka is able to deliver predictability to the service installation through high quality, easy-to-use products and test tools.

7. **Improved customer experience –** By eliminating the need to drill holes for new wiring and decreasing service turn-up time, the overall customer service experience is increased dramatically.

Typical IPTV Service Deployment Scenarios

The following diagrams illustrate two typical configurations for IPTV service delivery.

Figure 1 shows an broadband modem at the broadband ingress point delivering two streams of SD TV through two STBs, one of which also features a personal video recorder (PVR) or digital video recorder (DVR).
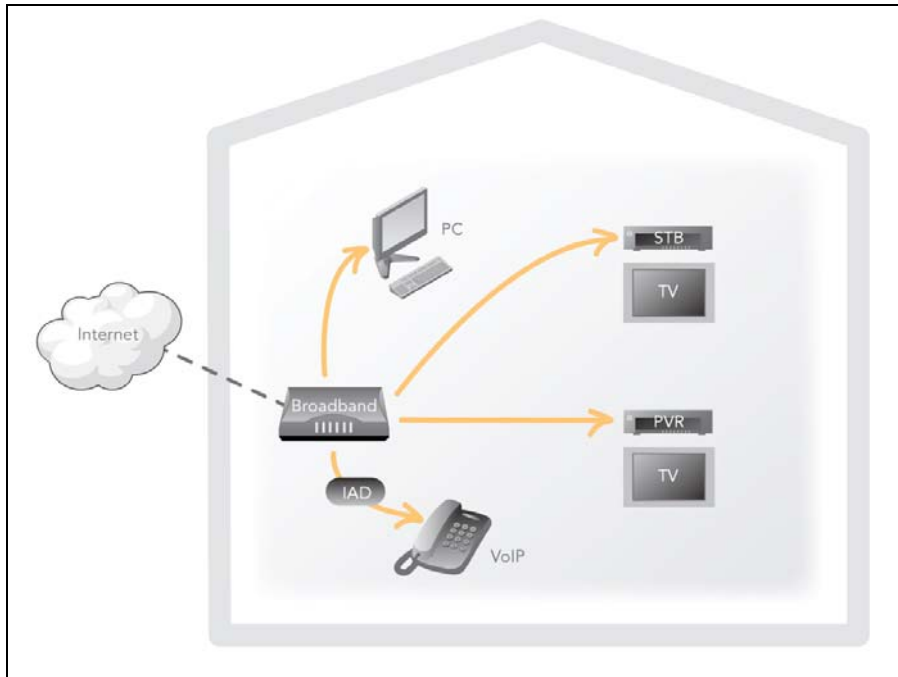
Figure 1: Two SD streams with one PVR

Figure 2 depicts three TV streams delivered via the broadband connection: two SD streams and one that can deliver both SD and HD.
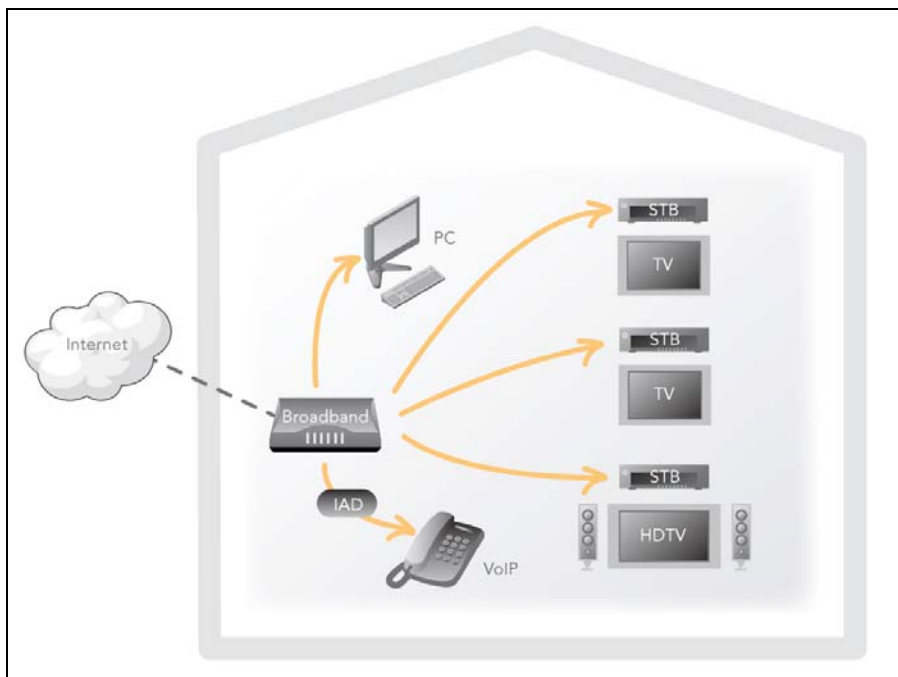

Figure 2: Two SD streams and one HD/SD stream

Deployment Options

Asoka has several options for service deployment in the two scenarios outlined above. The following section describes two deployment models with different STB configurations, as well as several options available within each deployment model.

Deployment Model 1: Two STBs with one SD and one SD/HD stream

Asoka has four different deployment options to address this particular service model:

Option 1
Three Asoka PlugLink AV 9660 Ethernet adapters are used over existing electrical wiring. In this model, the 9660 Ethernet adapter is used in three locations throughout the home:

     a) At the broadband router
        The broadband router is plugged in via Ethernet to the PlugLink AV 9660 adapter and the adapter is then plugged into an outlet. This injects the PLC signal throughout the home electrical system.
     b) At each STB
        Each STB is plugged into the PlugLink AV 9660 adapter via Ethernet and the adapters are then plugged into an outlet. This bridges the Ethernet connection to the STB over the powerline connection to the broadband router.

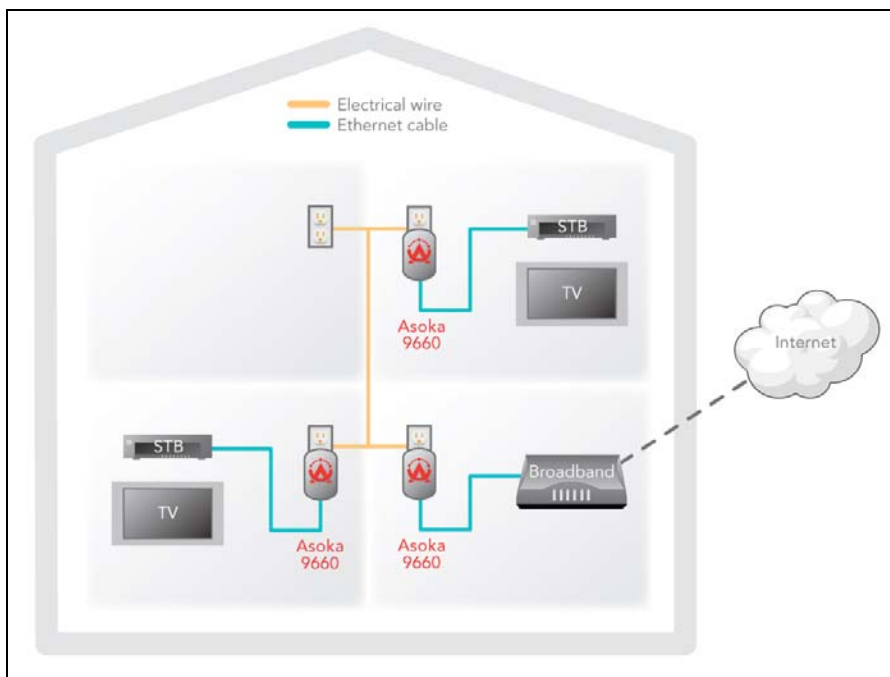Figure 3 below depicts this architecture in the home:

Figure 3: Three PlugLink AV 9660 Ethernet Adapters with two STBs

Option 2 (Two STBs)
Three Asoka PlugLink AV 9662 COAX adapters are used over COAX wiring. In this model, the PlugLink AV 9662 COAX adapter is used in three locations throughout the home where COAX cable exists:

a) At the broadband router – The router is plugged in via Ethernet to the PlugLink AV 9662 adapter and the adapter is then plugged into an outlet and to the COAX connection nearby. In this case, the adapter is merely powering itself from the electrical outlet and injecting the HomePlug signal over the COAX backbone in the home.
b) At each STB – Each STB is plugged into the PlugLink AV 9662 COAX adapter via Ethernet and the adapter is then plugged into an outlet and to the COAX connection nearby. Again, the adapter is merely powering itself as it makes use of the HomePlug signal on the COAX wire. The STB will then use the PLC segment that has been established between the adapter at the broadband modem via COAX and the one near itself.

Figure 4 below illustrates the use of PlugLink AV 9662 COAX adapters in this deployment scenario.
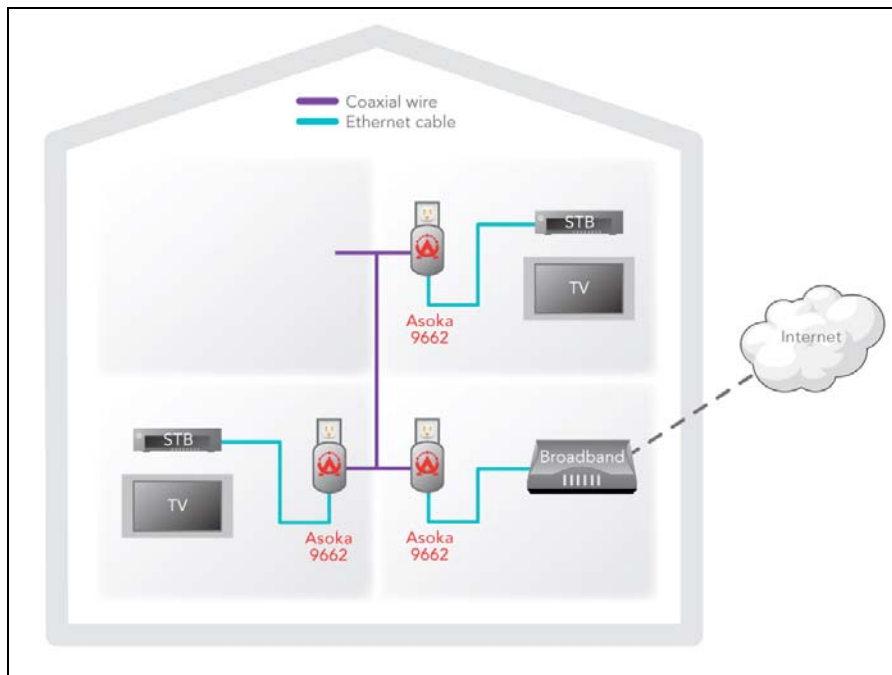

Figure 4: Three PlugLink AV 9662 COAX Adapters with two STBs

The advantage of this deployment option is that HomePlug over COAX can allow for higher bandwidth throughout the home due to minimal interference from other devices on the cable. However, in Deployment Model 1 outlined above (two STBs), COAX is not required as powerline can easily support the bandwidth requirements for one SD and one SD/HD stream. Additionally, the COAX method assumes that COAX connections are available in every desired STB location, which is not always the case.

Option 3 (Two STBs)
One or more PlugLink AV 9164 Digital Power Centers are used to provide additional outlets for expanded network connectivity over existing electrical wires. The PlugLink AV 9164 Digital Power Center is a unique product that solves one of the challenges of deploying HomePlug technology and electronic equipment in general – the availability of ample outlets in optimal locations.

Option 1 above using PlugLink AV 9660 Ethernet adapters assumes the use of a non-filtered power strip if more than one electronic device needs to be powered from the same outlet used by the PlugLink AV 9660 Ethernet adapter. The PlugLink AV 9164 Digital Power Center is a product that has six filtered,

surge-protected outlets as well as a 4-port HomePlug Ethernet switch. When plugged into an outlet in the home, it instantly injects the HomePlug signal throughout the home electrical system as well as providing six outlets to power the devices that typically sit near each other, such as the STB, TV, game console, and printer. Ethernet-based systems such as the STB, game console, printer, and computer can then be connected via Ethernet to the 4-port Ethernet switch on the PlugLink AV Digital Power Center to form an instant HomePlug AV-based network without the hassle of running power cables across the room or daisy-chaining power strips. In other rooms requiring network connectivity, the customer can use additional PlugLink AV Digital Power Centers or 9660 Ethernet adapters.

Figure 5 below illustrates the use of the PlugLink AV 9164 Digital Power Center in the room containing the entertainment center, with a PlugLink AV 9660 Ethernet adapter for STB connection in the other rooms.
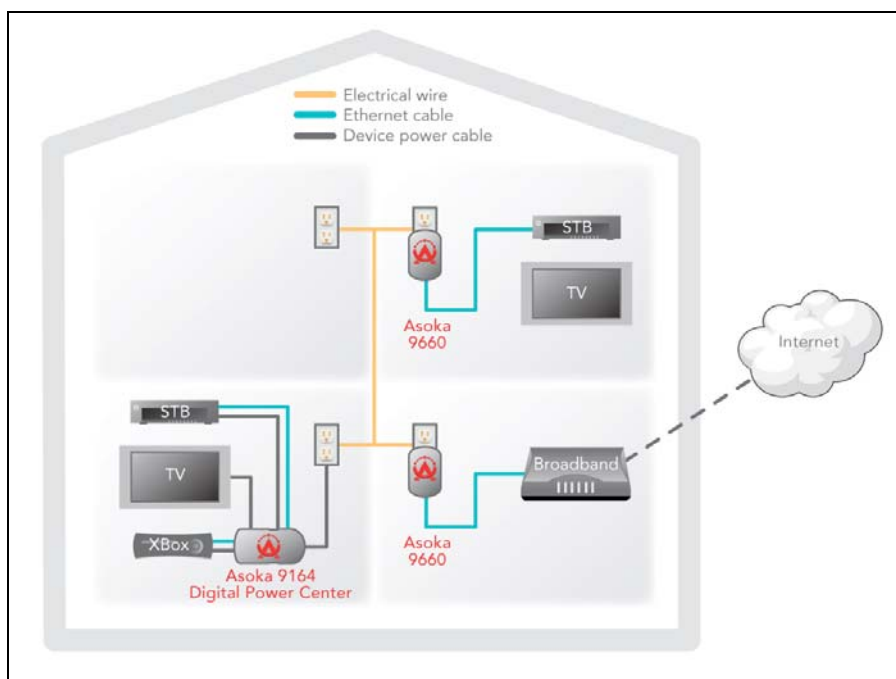

Figure 5: PlugLink AV 9164 Digital Power Center with PlugLink AV 9660 Ethernet Adapters and two STBs

The advantage of this deployment option is the sheer number of devices that can be powered (six) as well as connected to the HomePlug AV network (four) at a single location. This approach eliminates the hassle of daisy chaining power strips and running power wires across the room.

Option 4 (Two STBs)
This option is a hybrid model with a mixture of HomePlug AV and CAT5 (or alternate) media for service delivery. There may be cases where the diagnostic testing indicates that HomePlug AV over electrical wiring cannot be used on a particular segment in a home. Refer to the section entitled *Preparing for Deployment* below for more information on diagnostic testing.

If this location happens to be where the customer wishes to have the STB, the installer could choose to use both HomePlug AV for one room and CAT5 wiring for another. With this method, the service provider has complete flexibility to use the best technology for the best customer experience.

Deployment Model 2: Three STBs with two SD and one SD/HD streams

The primary difference between this and the previous model lies with the number of adapters used. As STBs are added, the number of Asoka adapters is increased in a linear fashion. Like the previous IPTV deployment model, Asoka has four different options for addressing this scenario.

Option 1 (Three STBs)
Four PlugLink AV 9660 Ethernet adapters are used over existing electrical wiring to connect the three STBs and one broadband router. In this model, the PlugLink AV 9660 Ethernet adapter is used in four locations throughout the home.

    a) At the broadband router
        The router is plugged in via Ethernet to the PlugLink Av 9660 Ethernet adapter and the adapter is then plugged into an outlet. This injects the PLC signal throughout the home.
    b) At each STB
        Each STB is plugged into the PlugLink AV 9660 Ethernet adapter and the adapters are then plugged into an outlet. The STB will then make use of the PLC segment that has been established between the adapter at the broadband router and the one near itself.

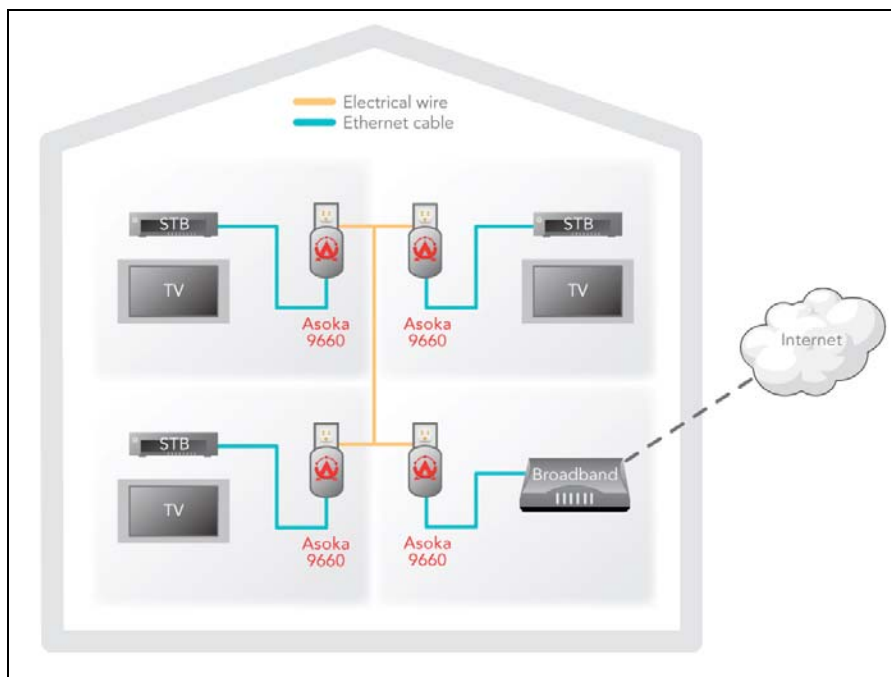Figure 6 below depicts this architecture in the home.

Figure 6: PlugLink AV 9660 Ethernet Adapters with three STBs

Option 2 (Three STBs)
Four PlugLink AV 9662 COAX adapters are used over existing COAX cabling to connect three STBs and the broadband router. In this model, the PlugLink AV 9662 COAX adapter is used in three locations throughout the home where COAX cable exists:

    a) At the broadband router – The router is plugged in via Ethernet to the PlugLink AV 9662 adapter and the adapter is then plugged into an outlet and to the COAX connection nearby. In this case,

the adapter is merely powering itself from the electrical outlet and injecting the HomePlug signal over the COAX backbone in the home.
b) At each STB – Each STB is plugged into the PlugLink AV 9662 COAX adapter via Ethernet and the adapter is then plugged into an outlet and to the COAX connection nearby. Again, the adapter is merely powering itself as it makes use of the HomePlug signal on the COAX wire. The STB will then use the PLC segment that has been established between the adapter at the broadband router via COAX and the one near itself.

Figure 7 below illustrates the use of PlugLink AV 9662 COAX adapters in this deployment scenario.
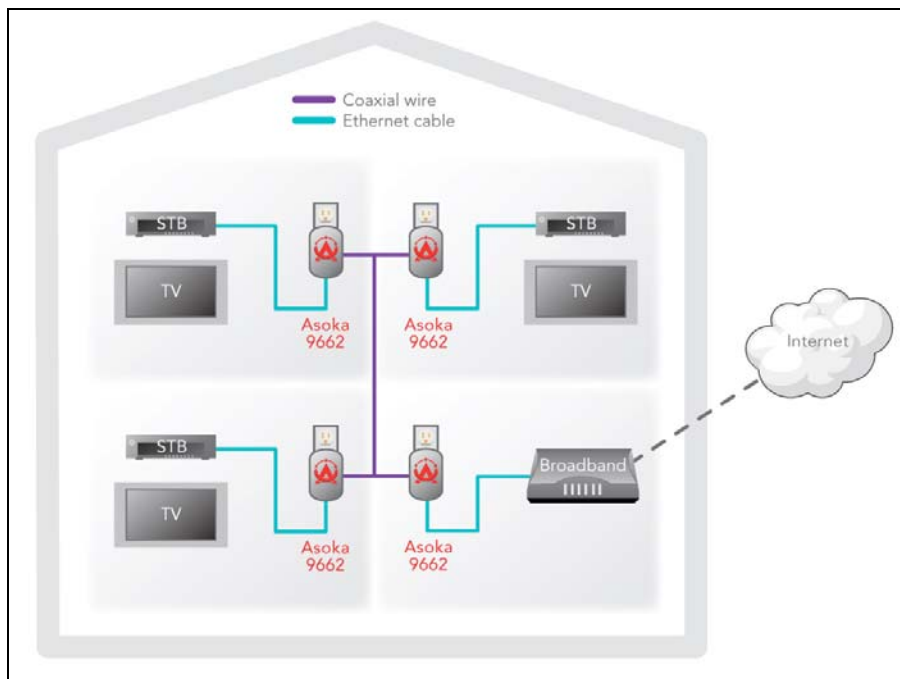

Figure 7: PlugLink AV 9662 COAX Adapters with three STBs

The advantage of this deployment option is that HomePlug over COAX can allow for higher bandwidth throughout the home due to minimal interference from other devices on the cable. However, in Deployment Model 1 outlined above (two STBs), COAX is not required as powerline can easily support the bandwidth requirements for one SD and one SD/HD stream. Additionally, the COAX method assumes that COAX connections are available in every desired STB location, which is not always the case.

Option 3 (Three STBs)
One or more PlugLink AV 9164 Digital Power Centers are used to provide additional outlets for expanded network connectivity over existing electrical wires. The PlugLink AV 9164 Digital Power Center is a unique product that solves one of the challenges of deploying HomePlug technology and electronic equipment in general – the availability of ample outlets in optimal locations.

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six outlets to power the devices that typically sit near each other, such as the STB, TV, game console, and printer. Ethernet-based systems such as the STB, game console, printer, and computer can then be connected via Ethernet to the 4-port Ethernet switch on the PlugLink AV Digital Power Center to form an instant HomePlug AV-based network without the hassle of running power cables across the room or daisy-chaining power strips. In other rooms requiring network connectivity, the customer can use additional PlugLink AV Digital Power Centers or 9660 Ethernet adapters.

Figure 8 below illustrates the use of the PlugLink AV 9164 Digital Power Center in the room containing the entertainment center with PlugLink AV 9660 Ethernet adapters for STB connection in the other rooms.
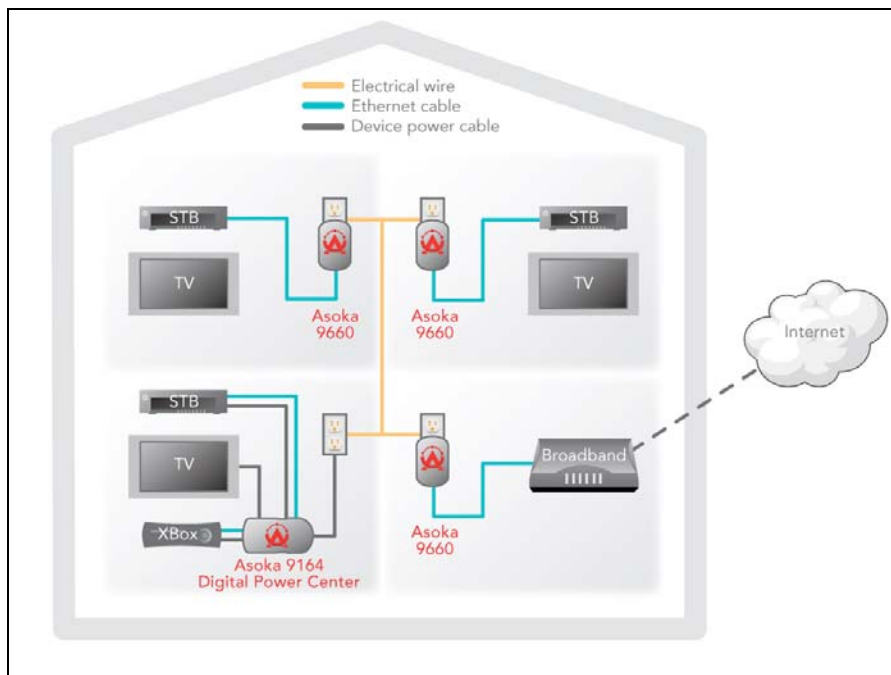

Figure 8: PlugLink AV 9164 Digital Power Center and PlugLink AV 9660 Ethernet Adapters with three STBs

The advantage of this deployment option is the sheer number of devices that can be powered (six) as well as connected to the HomePlug AV network (four) at a single location. This approach eliminates the hassle of daisy chaining power strips and running power wires across the room.

Option 4 (Three STBs)
This option is a hybrid model with a mixture of HomePlug AV and CAT5 (or alternate) media for service delivery. There may be cases where the diagnostic testing indicates that HomePlug AV over electrical wiring cannot be used on a particular segment in a home. Refer to the section entitled *Preparing for Deployment* below for more information on diagnostic testing.

If this location happens to be where the customer wishes to have the STB, the installer could choose to use both HomePlug AV for one room and CAT5 wiring for another. With this method, the service provider has complete flexibility to use the best technology for the best customer experience.

Preparing for Deployment

One of the challenges often faced by installers is the ability to determine the performance characteristics of each electrical wiring segment within a home. Especially for IPTV, this knowledge is critical to the reliable delivery of high quality video. To address this challenge, Asoka offers the PlugLink AV 8060 Performance Network Tester for proactive powerline segment performance determination.

This comprehensive test tool can be used by each IPTV installer prior to network configuration and installation. It allows the installer to quickly view the expected performance on a given powerline segment prior to full service installation.

The following process can be used by installers preparing for IPTV deployment.

a) The installer enters the home
b) The installer determines through customer input the desired location of STBs
c) The installer places a PlugLink AV 9660 Ethernet adapter in the outlet nearest the broadband router and connects his/her laptop to the adapter via Ethernet. This 9660 Ethernet adapter is called the "master pathway device"
d) The installer places Asoka PlugLink AV 8060 test tools in each outlet that will be used for HomePlug AV connectivity to the STBs.
e) The installer runs the Asoka 8060 test application on his/her laptop. Each segment from the master pathway device to the 8060 test tool will be tested for the following: TCP/UDP throughput, packet loss and jitter.
f) The installer can then quickly determine whether or not IPTV will work over a given segment and, if not, begins to either troubleshoot (eliminate/move noisy electrical devices, etc.) or make preparations for an alternate delivery mechanism within the home such as CAT5 cabling.

Advantages of the PlugLink AV 8060 Performance Network Tester

Although HomePlug AV technology has maximum limits in terms of distance (600+ feet), factors such as attenuation and line noise typically have a greater effect on performance degradation. A large majority of residential homes, unless extremely large, should have no problems with the STB being located across the home from the broadband entry point. The PlugLink AV 8060 Performance Network Tester was designed to provide a real-time snapshot of expected performance on a given powerline segment, regardless of line conditions and distance. With this tool, IP TV installers can, in minutes, determine the feasibility of using Asoka HomePlug AV technology to deliver high performance voice, video and data.

Asoka: the Ideal Partner for IPTV Deployment

There are several significant advantages to using HomePlug AV solutions from Asoka.

- They use the most pervasive infrastructure in the home; the electrical system.
- Installations are quick and predictable through plug and play hardware.
- Push button security enables incredibly simple, yet highly secure networking over the powerline network

- Asoka's PlugLink AV 8060 Performance Network Tester solves the primary challenge of IPTV deployment using a powerline medium – proactive powerline segment performance determination.
- Asoka's PlugLink AV adapter products do not require any configuration. They can be preloaded at the factory with a specific configuration supplied by the service provider. Parameters such as QoS, bandwidth, and LED behavior can all be customized and pre-configured on each unit before shipment, ensuring a consistent plug and play experience.

Asoka is a true business partner, helping service providers and systems integrators increase productivity and efficiency with lower installation and maintenance costs. As the leading powerline networking company delivering HomePlug®-certified products, Asoka helps carriers, service providers, operators, and systems integrators worldwide reduce support costs and increase revenues through its wide range of powerline-based products.

Asoka provides the utmost flexibility in supporting the unique needs of each service provider by offering private labeling, co-branding, and Asoka-branded product. With a complete backbone infrastructure to support contact centers, web stores, and a distribution/fulfillment house, Asoka makes doing business simple and easy so providers can focus on what they do best – servicing customers.

An innovator and trendsetter in high-quality, affordable powerline network solutions, Asoka reaches beyond residential network solutions to offer enterprise-grade solutions for commercial environments, including multi-dwelling and multi-tenant units (MDU/MTUs), hospitality, and small and medium business (SMB).

About Asoka USA

Asoka is a leading developer of simple, secure, and reliable powerline networking products that use existing electrical wiring to deliver high-speed networking throughout a home or business. Asoka's innovative products are sold globally through Carriers and Systems Integrators for both residential and commercial environments. The company offers the broadest and most complete portfolio of powerline products available today, and boasts powerline technology leadership and knowledge unparalleled in the industry. To learn more, visit www.asokausa.com.

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