

NETGEAR®

Digital Home Networking For Service Providers

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Today, Service Providers' residential Customers are using their broadband data networking services in a wide variety of applications, from basic data networking via the Internet to highly advanced applications involving real time audio/video, VPN for their home office and home automation. Most get started with simple computer networking for Internet and e-mail. Then they grow over time to add more applications to this basic Digital Home Network. All these applications are fueled by the wide availability of broadband network services.

Worldwide today there are roughly three hundred and fifty Million (350M) homes with broadband connections. Monaco and the Republic of Korea have digital broadband penetrations as high as ninety-three percent (93%). Eight other countries have penetration rates exceeding eighty-five percent (85%). Broadband data networking growth continues at an annual rate of sixty-five million (65M). In contrast, narrowband (dial-up) data networking is shrinking to as low as five percent (5%) of connected homes. The bulk of the applications, along with your customers' resulting Digital Home equipment needs, however, fall into a handful of pre-configurable packages that collectively serve an extremely high fraction (95%+) of your residential Customers.

Today, customers and service providers alike are furthermore hounded by time consuming tasks that are generated by:

- The huge and complex set of options available for every aspect of data networking and consumer electronics
- A lack of common standards for networking and product setup, interoperability and remote management
- Few if any pre-documented and pre-tested setup specifications for bouquets of networking and consumer electronics equipment that are known to be interoperable with your network services as well as each element of the package

These factors both frustrate and discourage all but the most tech-savvy and tenacious consumers. But worst of all, they generate high levels of support calls to Service Providers and discourage customer subscriptions to premium priced and vertical services, thereby denying Service Providers the lower costs and higher revenues they would otherwise garner.

In this white paper, we will examine:

- Popular applications that your residential Customers are using, in order of increasing complexity
- Revenue generating opportunities for Service Providers supplying these applications
- Customer Premises Equipment – core packages by application
- "No New Wires" customer premises interconnection methods

Popular Digital Home Applications



High Speed Internet Access (HSI)

Fast Internet Access is the original driver for the rapid success of Broadband Network services delivered by DSL and Cable Modems. Until 1997, the only broadband access available was typically at the Office, where most businesses used 1 or more T1's (1.5Mbps) for fast web and VPN access. Businesses rushed to install HSI because there was a huge productivity gain when converting from dial-up analog or ISDN service as the application transaction waiting times created by the explosion in the use of graphics (large file sizes) and motion were virtually eliminated.

Today, most residential customers with Internet use High Speed Internet services. They have experienced fast Internet at work and are unwilling to spend their leisure time waiting for data to arrive at analog modem or ISDN rates (<128Kbps), especially since most Service Providers charge between \$20 and \$40 USD per month for High Speed Internet service, making HSI affordable and the obvious choice for consumers.

Consumers who are using this service in its most basic mode are interested in applications that don't need Real Time performance: web browsing, e-mail, electronic commerce / banking transactions and documents plus video, music and software downloads. They typically subscribe to the entry level service at lower performance and price points and use mobile phones or baseband phone lines for Voice.

To supplement the entertainment video and music they get from their cable TV or satellite service providers, many of these basic residential customers are downloading video & music or storing their own media (video, music & photo) in their PCs. They typically have multiple PCs and would benefit from Network Attached Storage (NAS) both to store their Media for use from several PCs and for data backup.

The many who prefer to view movies on larger screens than PCs offer have also bought Digital Media Receivers (IP STBs for consumers) that allow them to view the Media they've stored or what they can stream from the Web on their TVs or HD Flat Panels.

So the basic home network consists of:

- Entry level Broadband Internet Access service
- Cable or DSL modem + a Router with wired Ethernet and WiFi (or a Gateway combining both)

However, when consumers decide to step up to real time services they are typically willing to upgrade their Internet access service and add significant software or terminal equipment for the service.



Network Printing & Scanning

Once the multiple computer residence is connected with HSI, your customers are ready to share a high quality printer and scanner using their data network. Some will have been "sneaker-netting" their notebooks to the printer and scanner. Sharing these resources, especially if wirelessly from notebook computers, is a nice convenience.



Network Attached Storage

In the beginning, Service Providers delivered simple broadband modems to their customers as the network terminating equipment (NTE). As multiple computers and IP devices in residences became the norm, they evolved to deliver routers and WiFi APs with the modems or integrated gateways (which include modems) as the NTE. Now that attached storage is becoming more widely used by consumers, there is a new opportunity in both equipment and service. By offering NAS with custom software, Service Providers can both delight their customers and capture Network Embedded NAS Backup service revenues by using their broadband networks in the “non-peak” in the middle of the day or night.

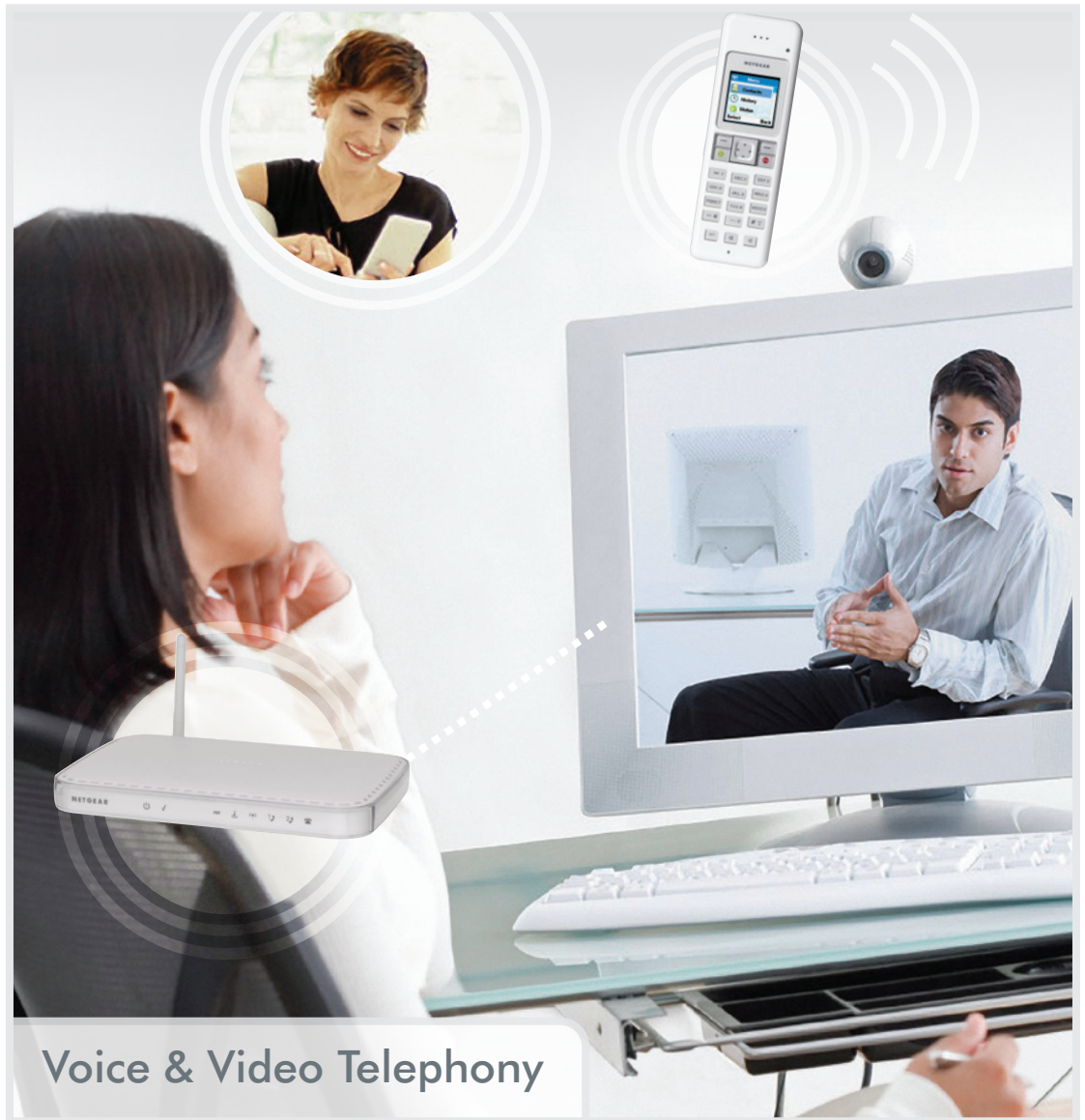
In a typical residence, media (videos, music and photos) is located on multiple computers. With the Digital Home Network this media can be used or shared by any networked computers, audio or display devices. To capture and store the distributed media in the digital home, consumers need network attached storage (NAS). This is often their next purchase once their digital home is networked.

Networked Attached Storage is simply an external drive that attaches to a Gateway or Router and is available to every computer on the network. Initially, many consumers simply use their PC operating system's file sharing capability. They supplement this with cheap, shareable, external USB drives.

The limitations of using a PC as a storage device are quickly apparent. The storage PC needs to be always on and available to the network. The content on it must be unprotected and therefore open to loss and corruption. The storage PC also cannot be easily configured with redundant drives. These concerns drive the consumer to purchase a NAS to efficiently back up all the media in their home.

With NETGEAR's ReadyNAS, customers can today rent or buy licensed videos or receive free videos (from media companies, strangers and friends) by downloading them directly to the NAS using the download agent that's embedded in the NAS. They can share free ones with others as well. Video entertainment in the home has never been easier to obtain.

The addition of Networked Attached Storage in the Digital Home raises the importance of the quality and through-put of the home network. Consumers are migrating to Gigabit Ethernet and 802.11n in order to compress data backup and media download times.



Voice & Video Telephony

With the addition of VoIP and Video calling over IP, the “triple play” is finally completed and delivered to customers over your converged network. Service Providers are today migrating to VoIP. Telcos do so as their fully depreciated analog switching centers become too old or costly to maintain. MSOs do so with Packet Cable voice as they scale deployments. Replacement with VoIP service delivery platforms pushes down the cost of voice services as network cost is reduced by virtue of two factors:

- The core network bandwidth demand is reduced by the use of low bit rate codecs and
- The cost of analog line appearances is externalized to customers or eliminated altogether when PCs with VoIP software or IP phones are deployed and directly connected to wired gateways

For VoIP, all that customers need is the addition of either Voice/IP DECT phones, software that is typically free for their PCs (to become phones), a VoIP terminal adapter or a VoIP + Data Residential Gateway with analog phones lines. They may then connect your VoIP service to their existing wired phones by simply plugging a

phone line appearance from their VoIP terminal adapter to an existing phone jack (which is normally wired to the other phones already) after their landline analog voice service is disconnected.

With the widespread adoption of the Internet and uptake of instant messaging, over the top VoIP providers like Skype, Yahoo and Googletalk have assembled very large subscriber bases. As before, these services were initially accessed directly from a PC. However, customers are increasingly being served with dedicated Service Provider branded appliances like the NETGEAR DECT Skype phone.

Video calling over IP allows a significant new service for consumers, a new revenue stream for SPs and is still in its' embryonic phase. Only today's Service Providers can popularize this innovative new method by tying today's phone numbering plan to both Voice and Video calling. This may create a "sticky" new service and revenue stream that is difficult for web site based competitors to displace.

To add voice and video calling to the mix, service providers embed servers and media gateways (for interconnection with today's PSTN) to their networks that control call setup, transmission and teardown for both the voice and video services. When combined with consumers' Femtocells and mobile phones or VoIP, landline analog voice becomes an obsolete service delivery method.

Service Providers on both the Cable and Telco sides will, over a few years of transition, realize a huge service delivery cost reduction as their wired network eventually collapses into four categories: broadband access platforms, SIP/MGCP servers, core high capacity switching and transmission network elements. Gone are the majority of baseband analog access platforms, media gateways, huge buildings and most of today's maintenance, heating and cooling expenses. This is similar to the transition that took place as Telcos transitioned from electromechanical to electronic switching and from analog to digital carriers in the 1960s and 1970s as well as the transition from analog to digital that the Cable TV companies started in the early 1990s.



Mobile Phones & Devices

With the advent of the Femtocell, Mobile Phone Service Providers are in a position to extend high speed services to consumers' handsets. The Femtocell is a small, fast 3G wireless base station placed inside customers' residences or businesses. Femtocells are similar to WiFi Hot Spots, however, they use licensed RF spectra to deliver multi-megabit per second data rates to wireless devices versus the unlicensed spectra that WiFi occupies.

When consumers are within reach of a Femtocell, they achieve very fast data rates that approach HSI throughput. Femtocells, when widely deployed, blanket a wider area than 3G wireless as they relieve traffic from the outdoor Macro Cells. This allows service providers to deliver improved wireless coverage from these "3G Hot Spots." When used for data with PCs, Femtocells deliver service seamlessly across both the WAN and LAN. This creates a significantly higher level of ease-of-use for consumers. When entering or leaving 3G/4G Hot Spots, there is no WiFi setup necessary or switching between WiFi and 3G radios. Femtocells eliminate the need for dual mode 3G/WiFi handsets, saving service providers and consumers additional costs.

Today, Femtocells support existing WiFi based networking. Service providers and consumers alike benefit from the transition to 3G wireless data networking services. Femtocells allow consumers to access their own data resources (shared folders on their PCs or NAS). They save money and time for consumers by letting them use their own HSI Service when within range of their Femtocell.

Service providers receive multiple benefits when offering home based Femtocells. They achieve:

- Increased wireless coverage and capacity from each cell
- Additional revenue since consumers pay for base station capacity added by their Femtocells
- Decreased wireless backhaul traffic as consumer traffic is routed over their own HSI Service
- Added premium revenue opportunities to sell video, music and business applications for cellular devices
- An increase in billable air time

In summary, Femtocells allow Service Providers to get more profit from their infrastructure.



HSI Access & Entertainment

Customers that make the transition to High Definition TV, Internet TV or On-Line gaming typically make a large investment in additional displays and receivers. Flat panels, HD STBs, Digital Media Receivers and Gaming Systems are some of the devices that demand higher network service levels. More importantly, consumers spend much more (typically 25% to 60% more) on your network and media services to enjoy rich, high quality entertainment at home.

When consumers want to upgrade their viewing experience, they typically begin by purchasing one or more flat panel HDTVs. Depending on how many rooms and how many screen sizes they are converting, Flat panel HDTV TVs total purchases range from \$2K to \$9K per consumer. Gaming, games and digital media receivers can typically add an additional \$1K to \$3K.

The greater availability of digital online content allows consumers to use their PCs to find and store videos. Customers are also creating their own media and saving it on their PCs. Besides their own content, customers also want media created by their friends or from the Web on sites such as YouTube, Facebook and MySpace. Finally, video and audio distribution sites like BitTorrent, Akimbo, iTunes and Disney are getting significant media revenues.

Consumers want to view or listen to their content on their many “screens” and “players.” Dedicated Digital media players like the NETGEAR EVA8000 stream content directly to TVs or PCs. Customers can view or listen to their Media from any source on any networked TV, stereo, portable player or PC in their digital home.

Entertainment, both high definition media and networked gaming, drives a surge in sales of higher bandwidth HSI with QoS at higher service pricing. To stream HD programming from an external source, consumers must have a minimum downstream bandwidth of eight Mbps. Consumers typically move up to this level of HSI service as they convert their multi-channel TV service to High Definition.



In addition to using Internet / IP TV with their newly upgraded HSI, consumers who choose to use DVRs to time-shift their viewing can connect their DVRs through the Internet for program schedules and to receive DVR software updates. No more slow dial-up downloads.



Security & Surveillance

In matters of security, consumers are searching for ways to monitor and control their environment. There are two areas of security where Digital Home Networks can assist consumers in their search for solutions:

- Safety of their very young children while at home in the care of employees and
- Security from theft or vandalism

Safety of Children

Parents in two wage earner households are increasingly hiring in-home care for their infants and young children. As every parent knows, child care workers don't always treat their children with the best of care. When parents see cases of criminal negligence by child care workers in the media, their concerns increase about their own child care situation.

With the advent of miniature wireless cameras, parents can now equip their homes with full time surveillance. Parents of small children can monitor their child care workers while away by using remote web access. Many parents are

interested in this type of surveillance while they are at work. To ensure the safety of their children, there is a high “willingness to pay” for the necessary software and hardware to enable real-time monitoring of the home. HSI solves the monitoring problem, allowing real-time remote access and recording.

In the same way, parents with older children and teens who go from school to empty homes for a couple of hours a day are interested in monitoring what their children are doing . Unwanted mischief and unwelcome visitors can be detected with the same surveillance setup. With remote monitoring, parents gain a level of control and safety in their home even while away.

Security Against Theft

Residential security is always on the minds of homeowners when they leave their homes for extended periods of time. By adding video surveillance to data service connections, homeowners can monitor their homes while they are away.

Surveillance recording is another service offering available through remote web access. Daily recordings are kept remotely (over the web) far from the home to protect against potential damage. Homeowners now have the option to capture all their surveillance videos at an off-site location. The consumer can choose intermittent or full motion video capture depending upon the level of detail they desire.

Service providers stand to gain significant revenues from home monitoring services. They can charge up to thirty dollars per month for a standard monitoring service that includes the ability to view camera feeds across the Internet. Service providers can gain an additional five to ten dollars per month when homeowners add remote recording and playback to their service. These revenues are a significant addition to the monthly charges consumers are willing to pay for internet access.

In summary, homeowners can achieve a new level of personal security through the Internet with providers’ security service offerings.



Metering

As home networks become pervasive, utility and service providers that in the past built their own dedicated networks are now starting to collect metering data as well as activate and disconnect utility service over the existing broadband access and home networks.

This creates a new recurring monthly service that's ripe for delivery to the electric, gas and water utilities. The key for Broadband Service Providers is to control the Residential Gateway as not a mere modem but as a Service Delivery platform that enables services to both residential subscribers and the utility companies that serve them.

Today, utility companies must send field personnel to homes to read meters. The cost to send personnel to each and every home is a necessary burden for utility companies.

Manual meter reading can be replaced as home networks become pervasive, and this trend is accelerating, having been pioneered by small municipal utilities that also deliver phone service. Utility companies collect metering data electronically over the service provider access network, reducing considerable personnel costs.

Service providers can now offer a new monthly service to the electric, gas and water utilities. This is a major paradigm shift for service providers. No longer are they simply supplying modems to the home. They are now creating a wide range of services delivered through a Residential Gateway. The Residential Gateway becomes a Service Delivery platform that enables services for both residential subscribers and the utility companies that serve them.

There are currently a wide range of networked meters available for new installations. There is also a wide range of the electronic components that may be used to develop retrofit kits for existing meters:

- miniature cameras from mobile phones for photographing analog meter readings,
- battery charging ICs,
- DC-DC ICs,
- 4 bit/8 bit low power processors,
- powerline, twisted pair wired,
- WiFi, Zigbee and 2G/3G mobile networking,
- miniature low power solar panels,
- hardened metal casings and
- liquid nail glue for mounting to existing meters.

Service Providers will find utility companies willing to pay something in the range of five dollars per month for this service. They will also purchase or lease the terminal equipment.



Energy Management

Energy management is an application where the technology has recently reached the market. It is in an early adoption phase due to the dramatically increasing cost of energy. There are now available many types of lighting switches, thermostats and controllers that use extremely low bit rate communications over power lines to adjust lighting or HVAC settings. Through the use of energy management, consumers can lower their home energy consumption.

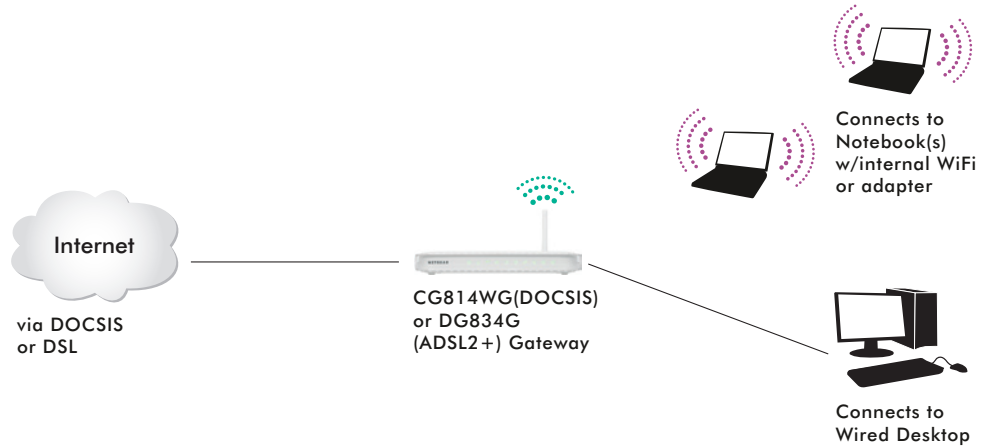
Energy management allows customers to remotely manage and monitor their residences. With this service, they can change thermostat settings when their plans change. For example, if a family leaves for vacation and forgets to turn down their heat, water heater or air conditioning, they can now change the settings at a later time. Once families hear that their friends are saving money controlling their energy systems through the Internet, they'll want to add these services too.

Not only are customers able to remotely manage and monitor their residences, but they also get the convenience of changing settings when plans change, so that they're not, for example, heating or air conditioning the house when they're out.

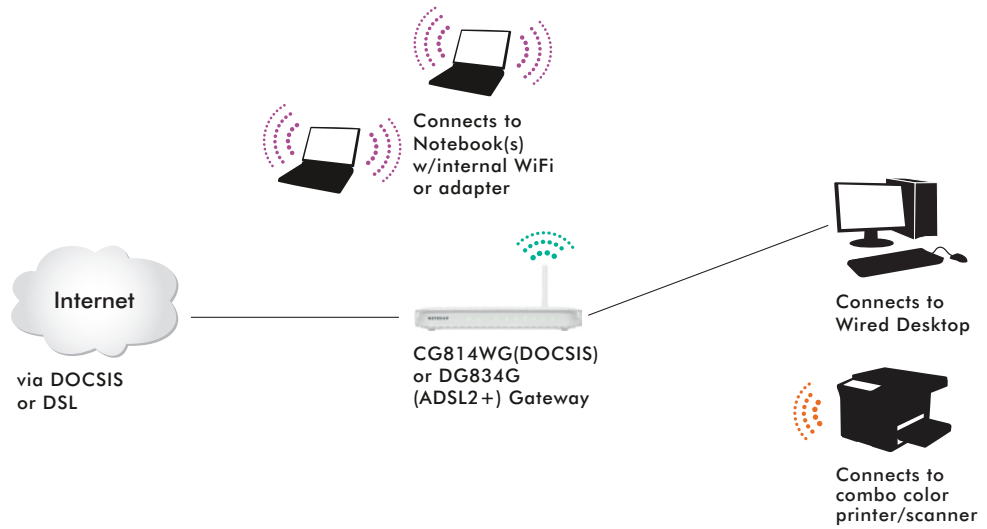
If offered in Web-based remote access form, consumers may be willing to pay something in the range of five dollars per month for energy management service.

Applications Illustrated with Netgear Products

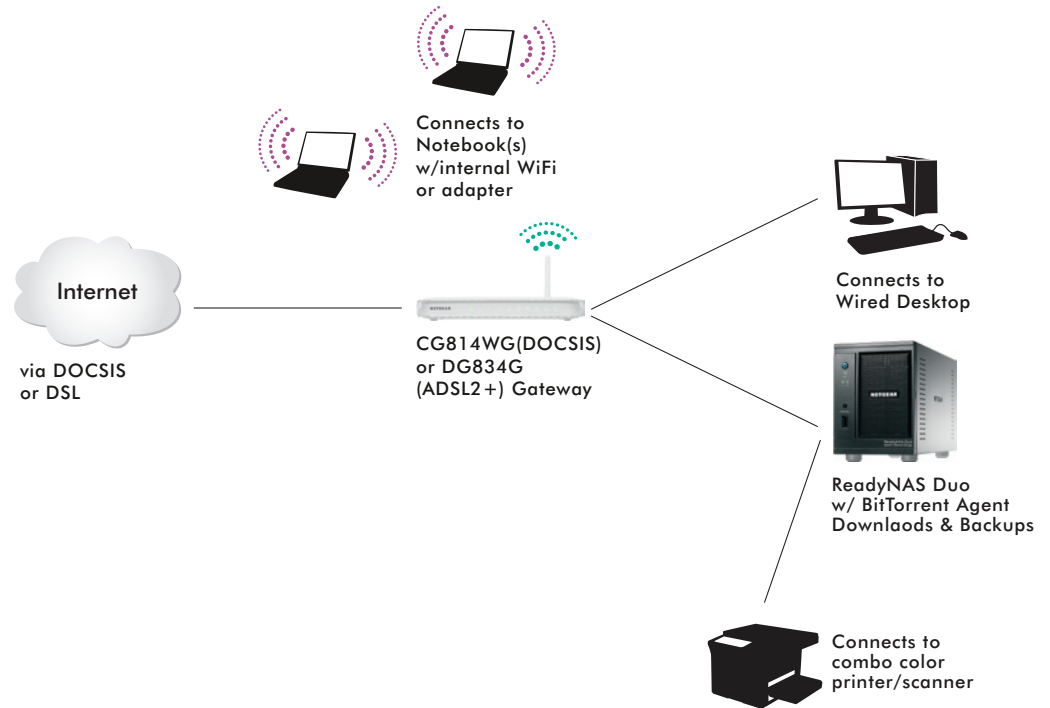
A – Simple High Speed Internet Access



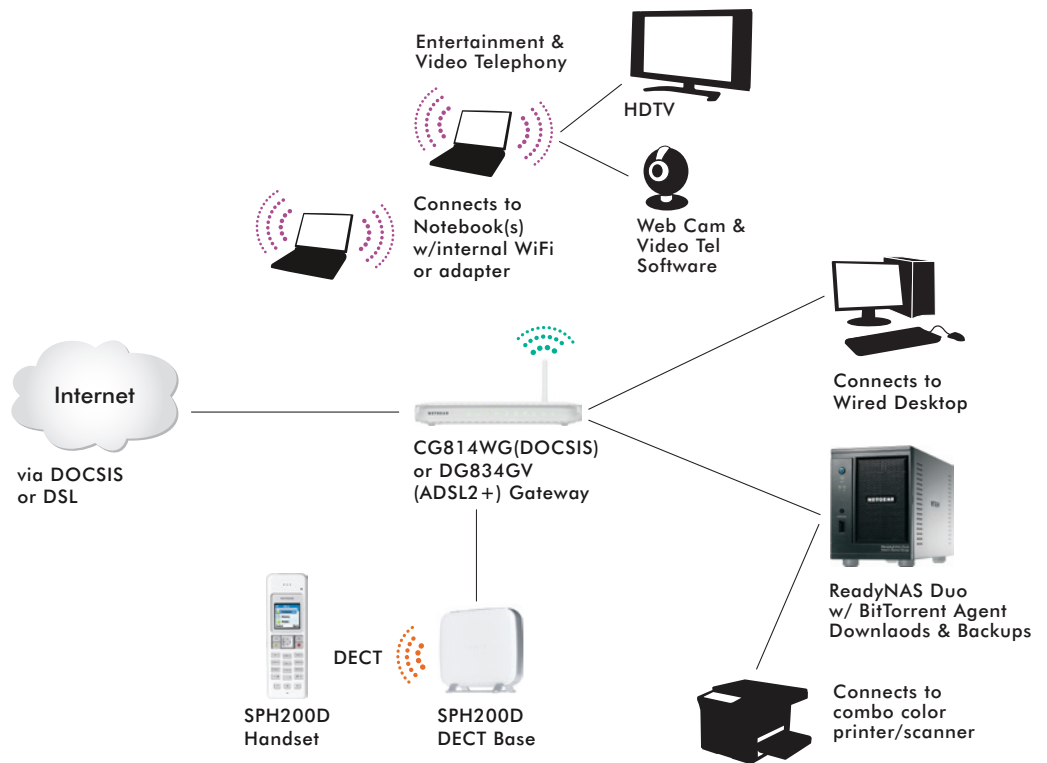
B – Add Printing & Scanning



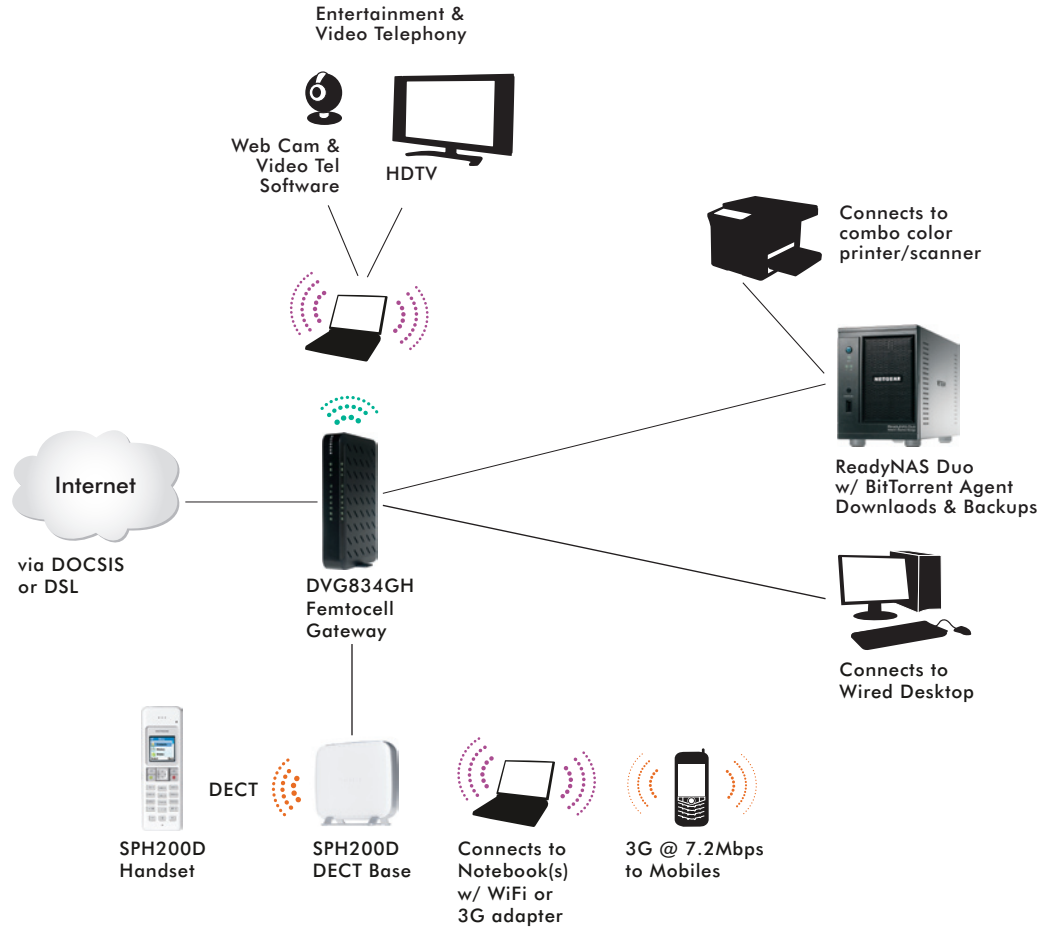
C – Add NAS



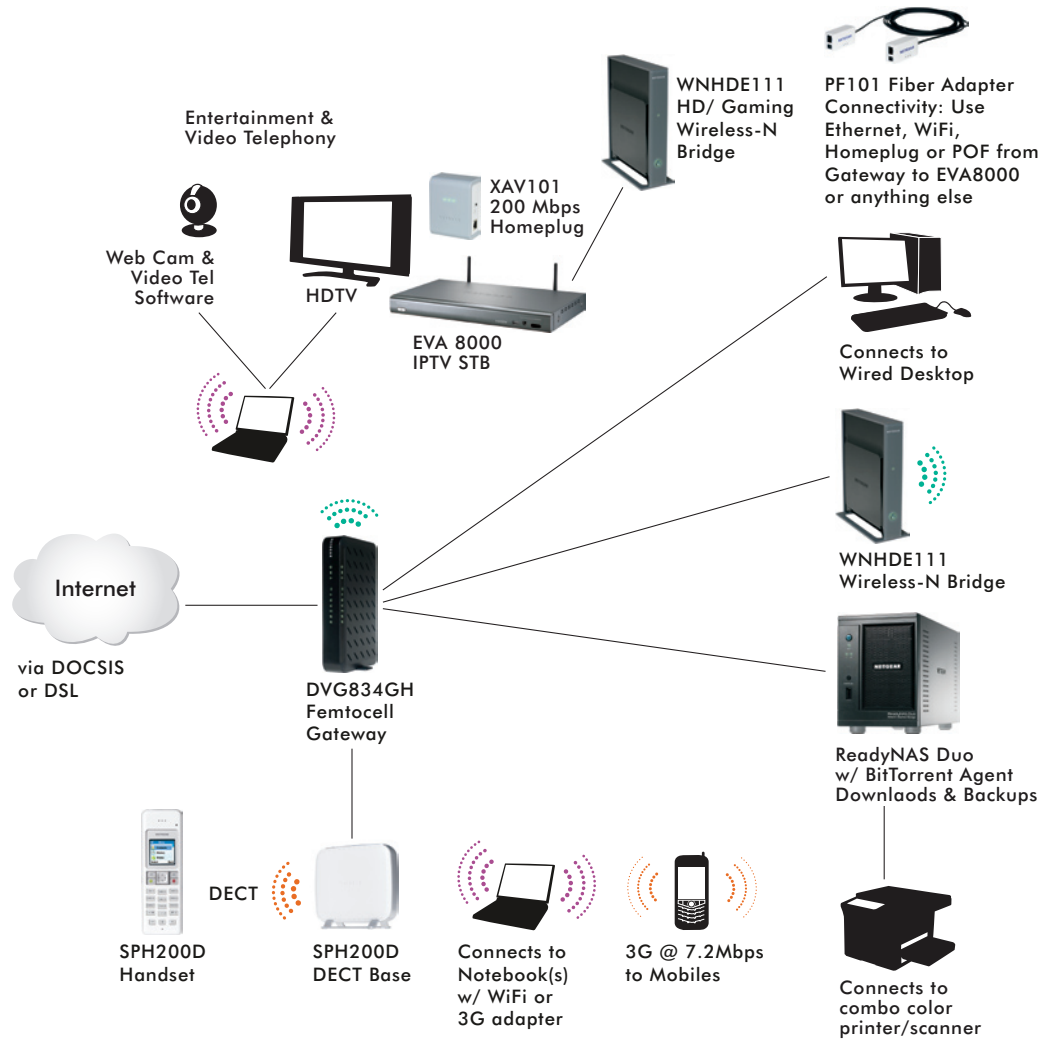
D – Add Voice & Video Telephony



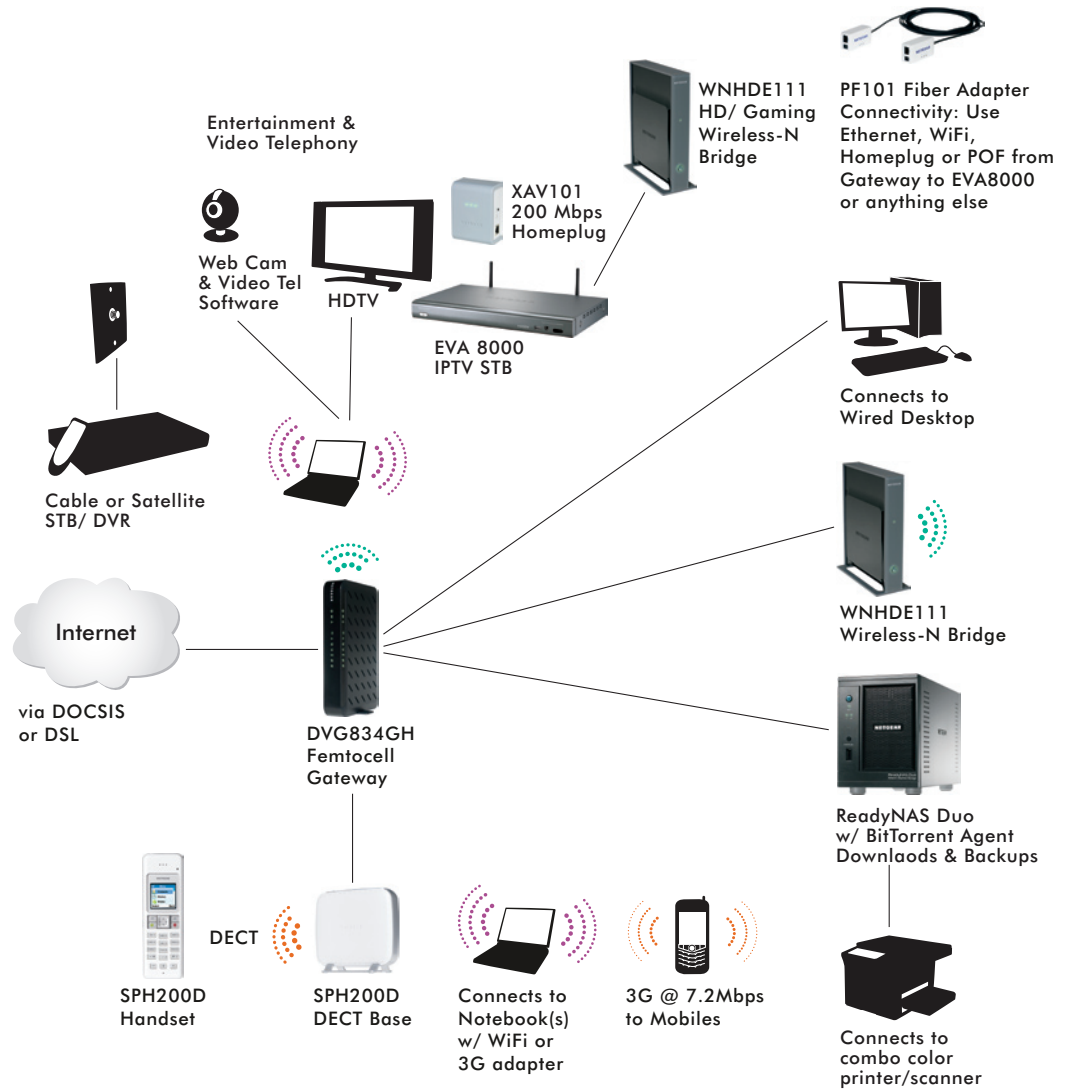
E – Add Mobile Phones & Devices



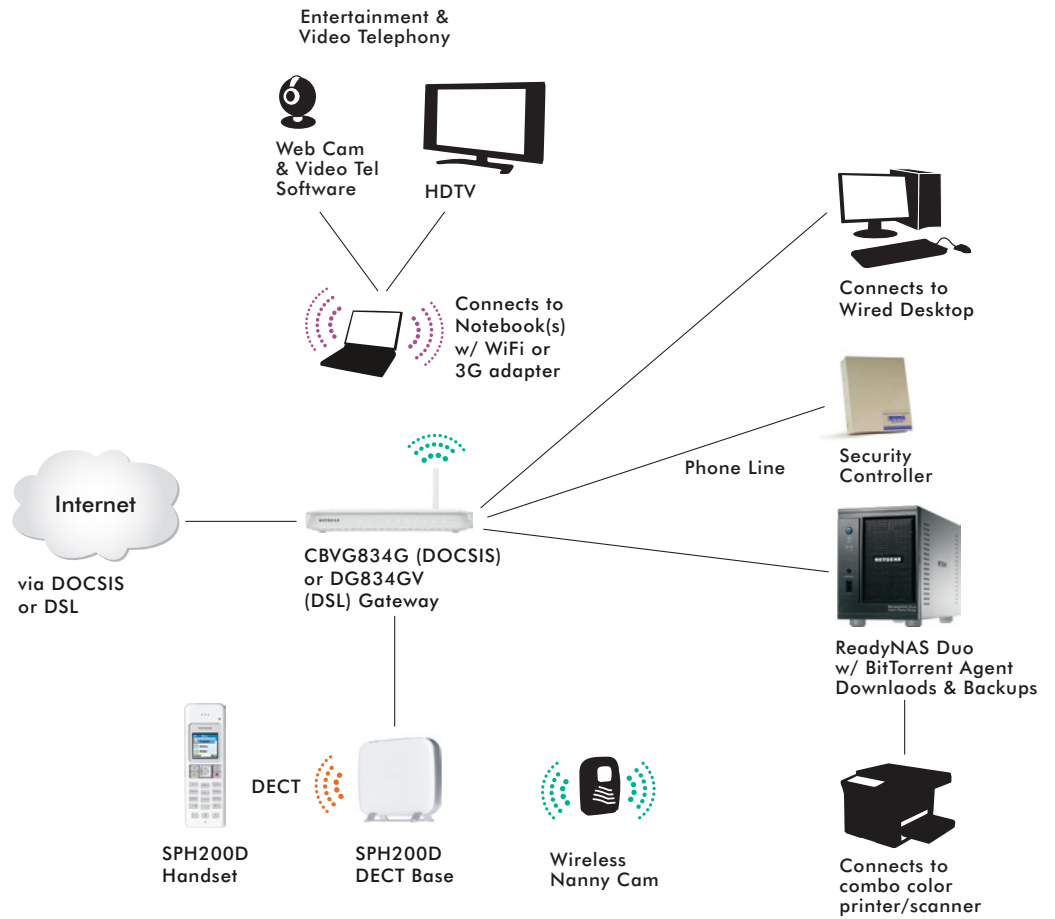
F – Add IPTV, Photos & Audio, Games



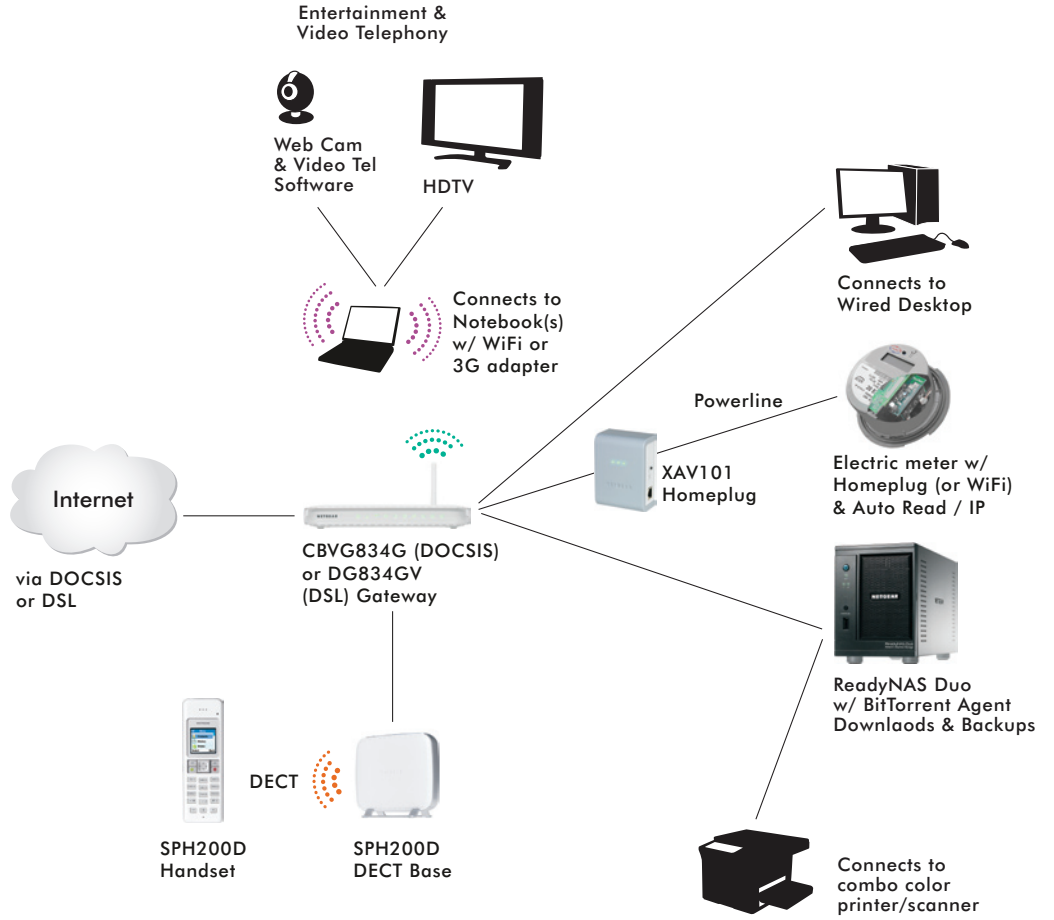
G – Add Cable/Satellite DVR over Broadband



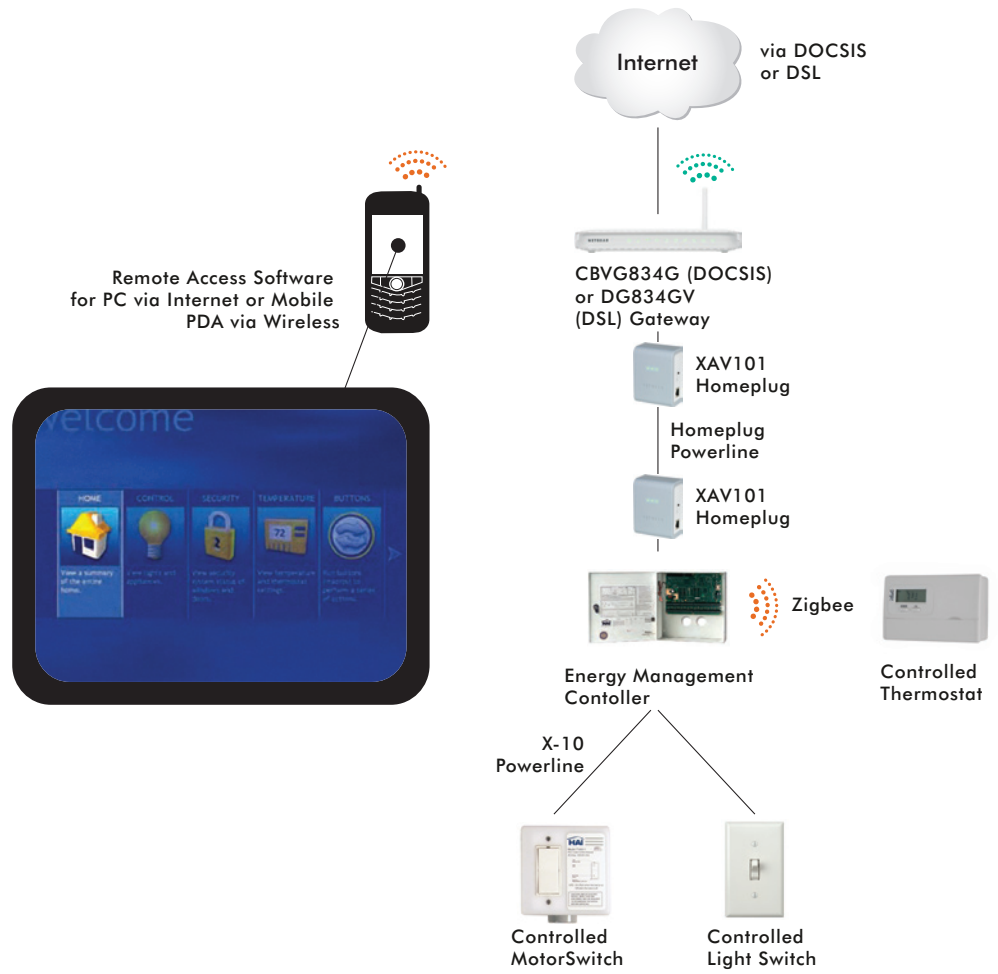
H – Add Security & Surveillance



I – Add Metering



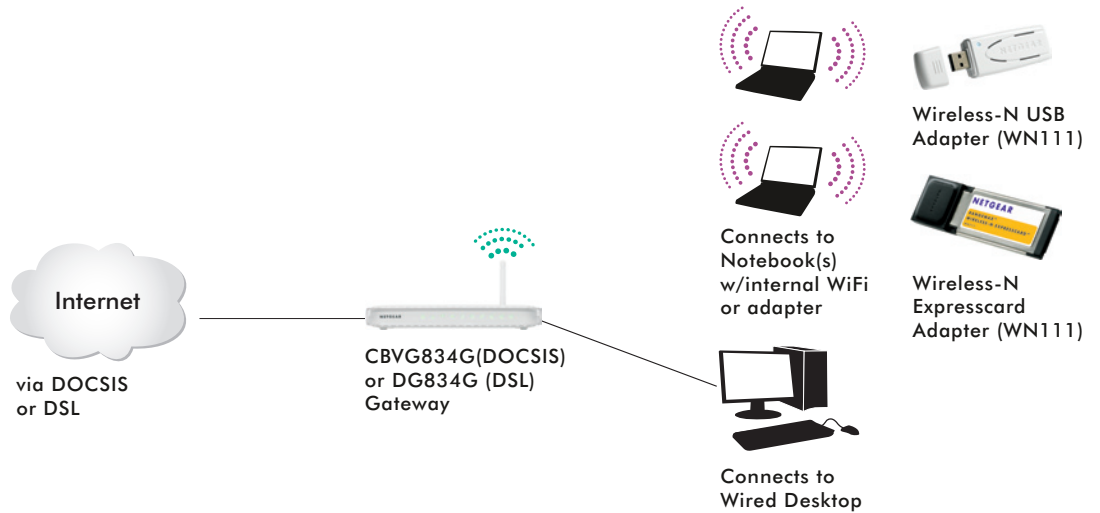
J – Add Energy Mgt



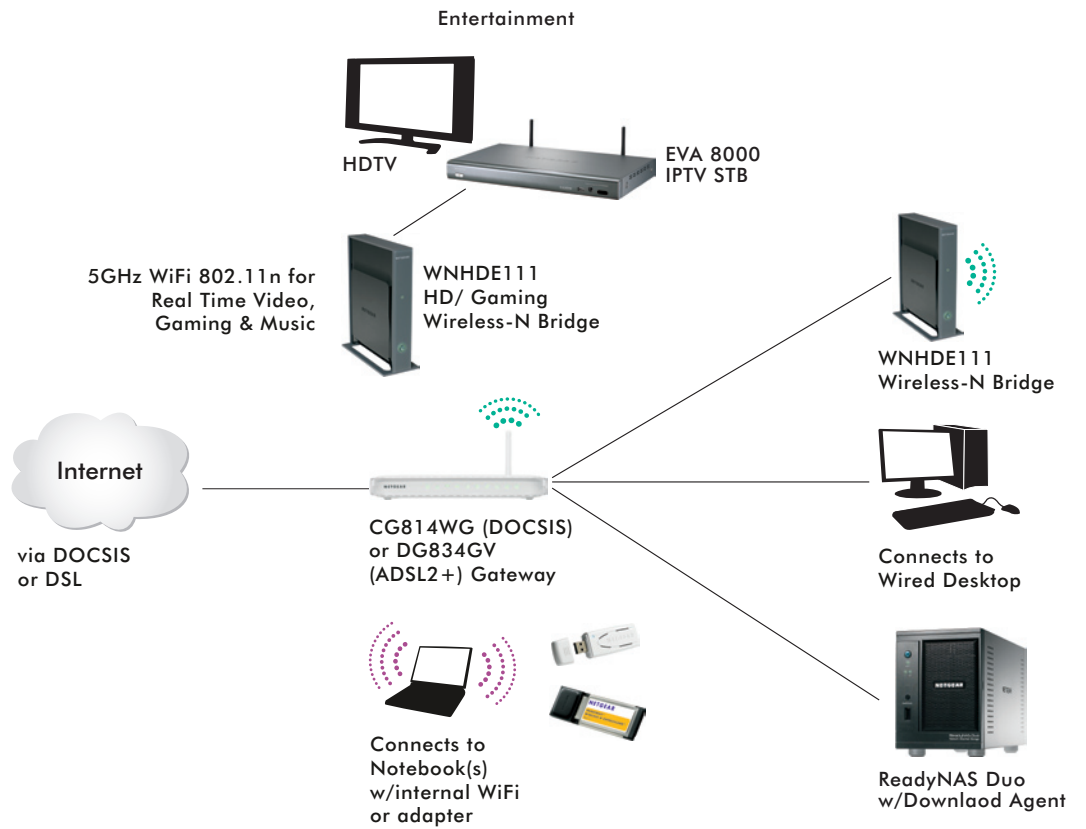
“No New Wires” with Netgear Connectivity Products

With multiple devices in the home all connected and sharing data internally and across the internet, the Digital Home’s network performance becomes critical. This is especially the case for gaming and video. To improve network performance and to ensure whole home coverage, NETGEAR offers a broad line of Digital Home data distribution products like the 100Mbps Plastic Optical Fiber kit, 200Mbps Homeplug (powerline) adapters, 175Mbps MoCA adapters and the 300 Mbps 802.11n WiFi Bridge Routers.

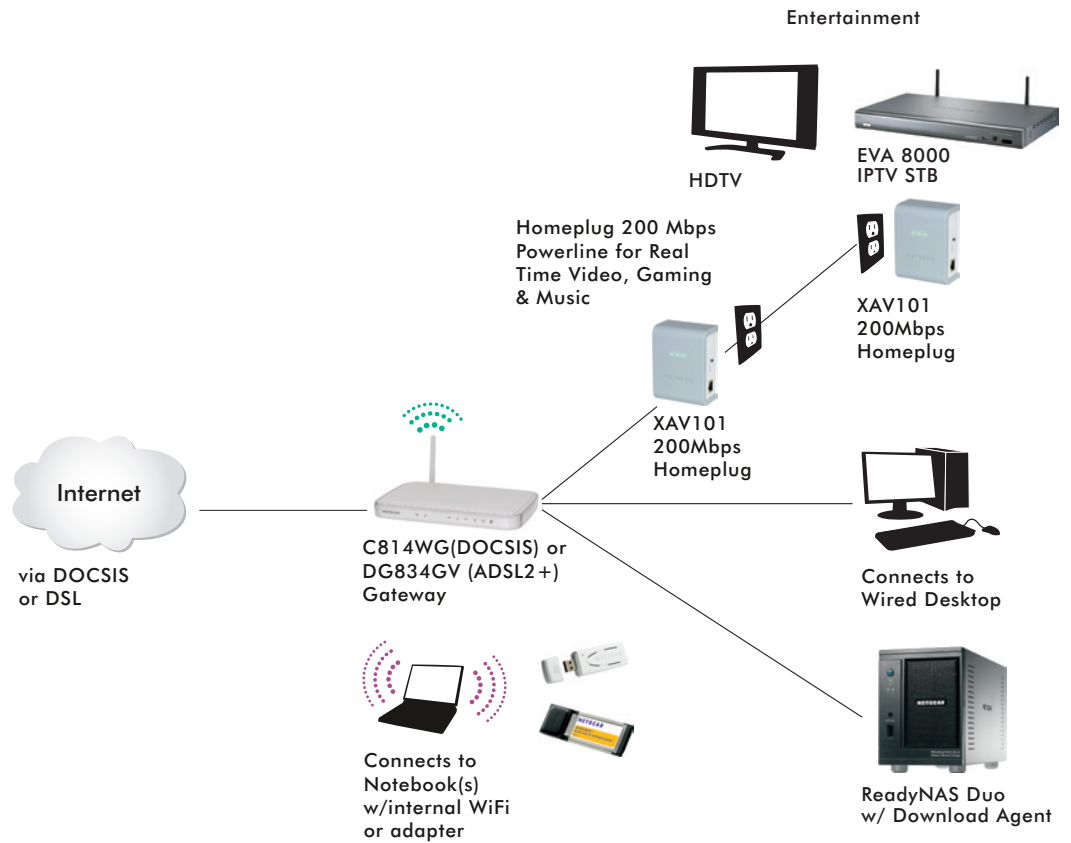
A – WiFi & LAN for Data



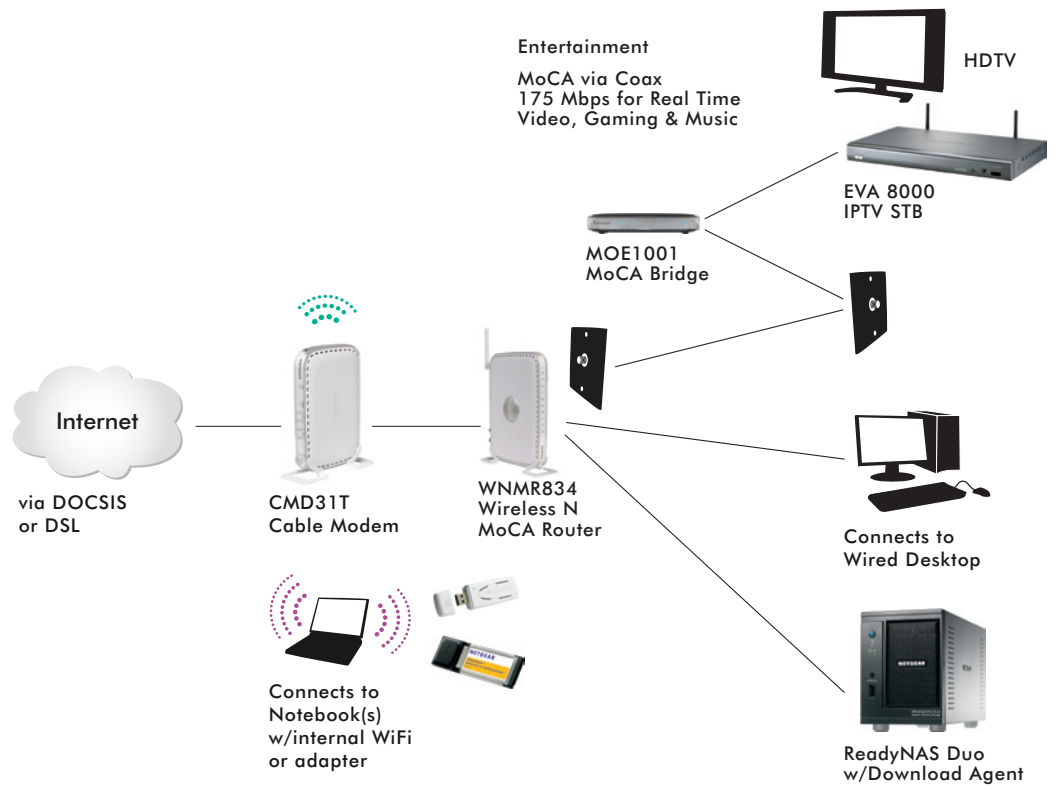
B - WiFi & LAN for Data + 5 GHz WiFi (N) for Real Time Apps



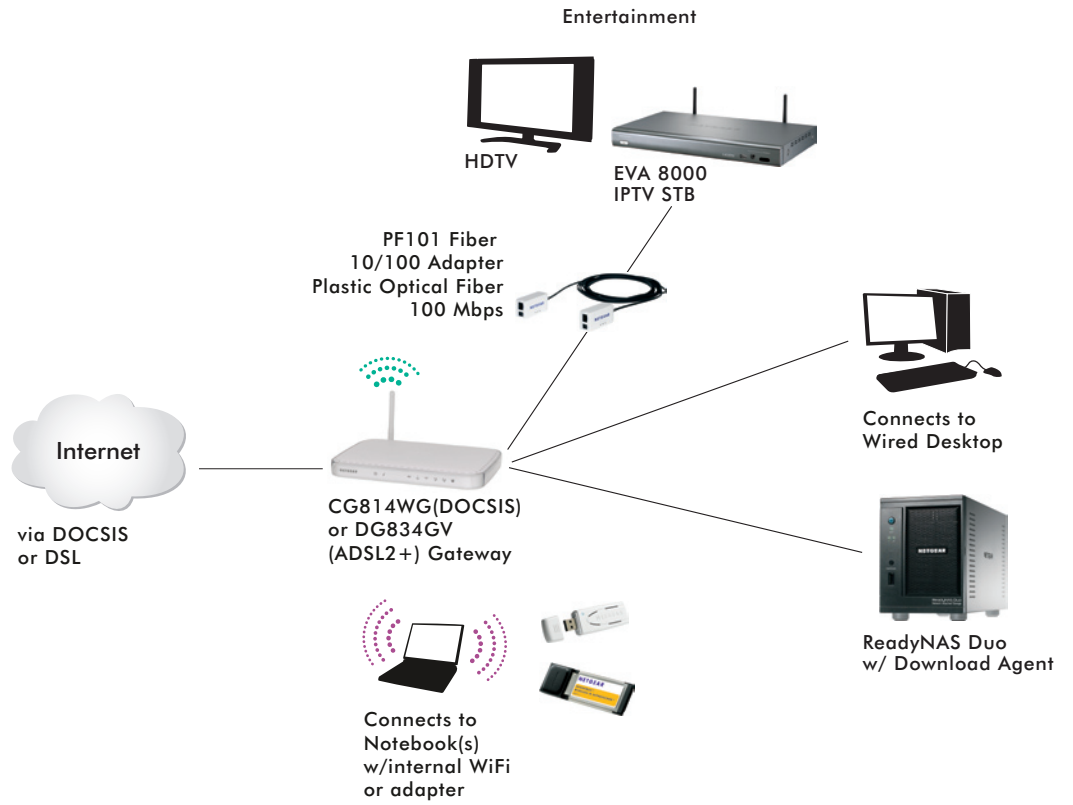
C – WiFi & LAN for Data + HomePlug Powerline for Real Time Apps



D – WiFi & LAN for Data + MoCa for Real Time Apps



E – WiFi & LAN for Data + PoF for Real Time Apps



Netgear Product Configurations for Digital Homes

A – Gateways & Modems

WAN							
	Up to ADSL2+	VDSL	Ethernet	DOCSIS 2.0	DOCSIS 3.0	Mobile	
LAN	1 Port Modem	DM111P	X	X	CM232	CMD31T/CME31T	MBM621 (3G)
	4 Port Gateway	DG834	VG934	RP614	CG814CCR	In Development	
	4 Port + .11g Gateway	DG834GU	X	WGR614	CG814WG	X	DG834GU (3G), MBR814XUC (TD-CDMA), MBR814XF (Q-com OFDM)
	4 Port + .11n Gateway	DG834NU	VG934NU	WNR834B, WNR2000, WNR3300, WNR3500, WNDR3300	X	In Development	X
	4 Port + Voice + .11g Gateway	X	X	WGR613V	CVG824G	X	X
	4 Port + Voice + .11n Gateway	X	VG934NOU	X	X	In Development	X
	4 Port + DECT + .11n Gateway	In Development	In Development	X	X	X	In Development
	1 Port + Voice + .11g Gateway	DVG631GU	X	X	X	X	X
	Femtocell + 4 Port + VoIP + .11g Gw	DVG834GH	X	X	X	X	X

X = Not Planned or Not Scheduled

B – In-Home Distribution

In-Home Distribution Technology					
	Plastic Optical Fiber	WiFi Bridge	Homeplug	MoCA	
Port & WiFi Arrangement	1 Ethernet at each end	PF101	XAVB101 (200Mbps Kit of 2) HDX111 (200M w/AC plug - Use 2) HDXB101 (200Mbps, Kit of 2) XE103G (85Mbps, Kit of 2) XE102G (14Mbps, Kit of 2)	In Development	
	Ethernet at one end + .11g WiFi at the other		WGXB102 (14 Mbps, Kit includes both ends)		
	1 Ethernet at one end + 4 at the other		XE104G (85 Mbps, Kit includes both ends)		
	1 Ethernet at each end + space saving DC power for router at remote end		XEPSB1001 (85 Mbps, Kit includes both ends)		
	1 Ethernet at one end Add-On Adapters		200Mbps: XAV101, HDX111 85Mbps: XET1001, XE104 14Mbps: XE102, WGX102	In Development	
	2 E-Net + .11n AP or Bridge each end		WNHDEB111		
	4 Ethernet + .11g WiFi				WNMR834

C – Storage

		BAYS		
Number & Cap		2	4	6
DRIVES	0 - Drives		RND4000	
	1 - 500GB	RND2150		
	1 - 750GB	RND2175		
	2 - 500GB		RND4250	
	1 - 1TB	RND2110		
	3 - 500GB			RNDP6350
	2 - 750GB		RND4275	
	2 - 750GB + 1G RAM		RND42751G	
	2 - 1TB		RND4210	
	4 - 750GB		RND4475	RNR4474
	4 - 750GB + 1G RAM		RND44751G	
	3 - 1TB			RNDP6310
	4 - 1TB		RND4410	RNR4410
	6 - 1TB			RNDP6610

D – Digital Media receivers & VoIP Handsets

Digital Media Rcvr / VoIP Handsets	Model
VoIP/DECT/Analog Phone + Base W/Skype	SPH200D
Add'l VoIPVoIP/DECT Phone W/ Skype	SPH150D
VoIP/WiFi .11g Phone w/ Skype	SPH200W
High Def Digital Media Receiver (IP to HD TV)	EVA8000
VoIP DECT Phone (SIP)	AW206
VoIP WiFi Phone (SIP)	WPH102

E – Adapters for PCs and Consumer Electronics

ADAPTER TYPE		
Connection	Description	Model
PCMCIA (Notebook)	Super G - .11g WiFi up to 108Mbps	WG511T
	Rangemax G MIMO - .11g WiFi 108Mbps + 10x reach	WPN511
	Rangemax - .11n/g WiFi 270bps + 10x range	WN511B
	Rangemax NEXT - .11n/g WiFi 300bps + 10x range	WN511T
	Wired Gigabit Ethernet	GA511
	Wired 10/100 Mbps Ethernet	FA511
PCI (Desktop)	Super G - .11g WiFi up to 108Mbps	WG311
	Rangemax G MIMO - .11g WiFi 108Mbps + 10x reach	WPN311
	Rangemax - .11n/g WiFi 270bps + 10x range	WN311B
	Rangemax NEXT - .11n/g WiFi 300bps + 10x range	WN311T
	Rangemax NEXT - .11n/g WiFi 300bps + 10x range Express Card	WN711
	Wired Gigabit Ethernet	GA311
USB 2.0 (CE & PC)	Wired 10/100 Mbps Ethernet	FA311
	Super G - .11g WiFi up to 108Mbps	WG111
	Rangemax G MIMO - .11g WiFi 108Mbps + 10x reach	WPN111
	Rangemax NEXT - .11n/g WiFi 300bps + 10x range	WN111
	Rangemax NEXT - .11n/g Dual Band WiFi 300bps + 10x range	WN121T
	Rangemax NEXT - .11n/g Dual Band WiFi 300bps + 10x range	WNA3100