

# RESIDENTIAL GATEWAY TRENDS: Bringing Value Home

A Parks Associates Whitepaper Developed for



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# Residential Gateway Trends: Bringing Value Home

The residential gateway is at the center of the digital home with direct connectivity to the service provider's network.

Due to its unique strategic position in the home broadband network, the gateway is critical in enabling service providers to answer growing market demands, maintain customer loyalty, and be profitable in today's complex competitive environment.

- Residential gateways access multiple devices, minimize support costs, and improve the customer experience when support is needed.
- High-end gateways flourish in areas with high rates of bandwidth service, having homes with multiple Internet-connected devices, and consumers displaying an appetite for value-added services.
- Broadband providers equipped their customers with over 75 million routers and residential gateways<sup>1</sup> worldwide in 2012, a number that will grow to 120 million by 2017.
- Distribution of these high-end, operator-provided gateways will accelerate more quickly than standard gateways, growing from 39 million in 2012 to 65 million units per year by 2017.
- Today, Jungo is the largest provider of third party gateway middleware, and deploys software in 25% of operator-provided high-end gateways.
- North America and Western Europe are the largest global markets for operator-supplied high-end residential gateways.
- Several industry trends affect residential gateway design, including the following:
  - » Improved processing power and on-board SoC features;
  - » Changes to Wi-Fi;
  - » Designed for cloud services;
  - » Movement from 2-box to 1-box solutions;
  - » Differentiation via the software;
  - » The addition of value-added features;
  - » Improvements to home network management;
  - » Software development beyond the OEM; and
  - » Requirements for greater flexibility in software.
- As the industry evolves, additional future trends will include:
  - » Greater software complexity;
  - » A move to client-server architectures;
  - » The emergence of cloud-based services;
  - » Features to address transcoding and video; and
  - » Operator and third party software development.

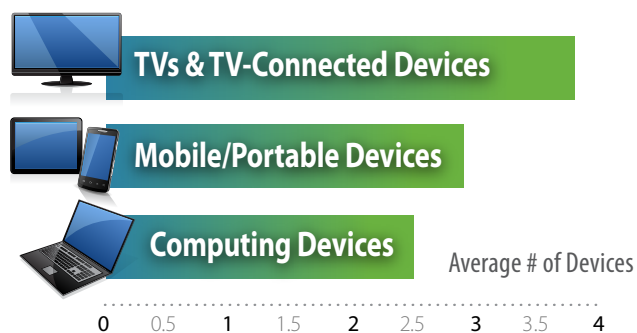
## Motivation for the Residential Gateway

Today's operator-supplied residential gateway was born out of a need to address growing complexity within the home.

**Consumers not only seek in-home Internet access for a growing variety of CE devices, (Figure 1), but also desire to leverage the home network to allow interaction among their devices.**

*However, setting up and maintaining a home network remains no small task.*

## Average Number of Consumer-purchased CE Devices per U.S. Broadband Household



Source: Residential Gateway Trends: Bringing Value Home  
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Figure 1: Average Number of Consumer-purchased CE Devices per U.S. Broadband Household

<sup>1</sup> Residential gateways include router functionality.

The residential gateway facilitates the addition of new devices to the home network and allows the operator insight and access into the home network. Due to its presence, when customers call with problems, the support team can more **quickly diagnose** the issue, thus **reducing operator costs**. At the same time, consumers are able to resolve connection-related issues quickly, thus providing them with a good experience which results in **high satisfaction**.

*As triple-play providers work to avoid having their services become commoditized, many perceive **residential gateways** as a path to greater subscriber value and differentiation.*

By leveraging the gateway's hardware and software capabilities, operators can **introduce new services and derive new revenues quickly**. Where those services include content, the gateway can also provide greater content security. In sum, the residential gateway delivers both reduced costs and new revenue opportunities.

## Definition of the Residential Gateway

Broadband CPE ranges from simple devices that provide basic access to complex systems with robust computing resources that support a variety of operator services.

Today, the devices in the market are so varied in capabilities that market players often have difficulty classifying gateways into defined groupings. For this whitepaper, Parks Associates sorts gateways into the following categories:

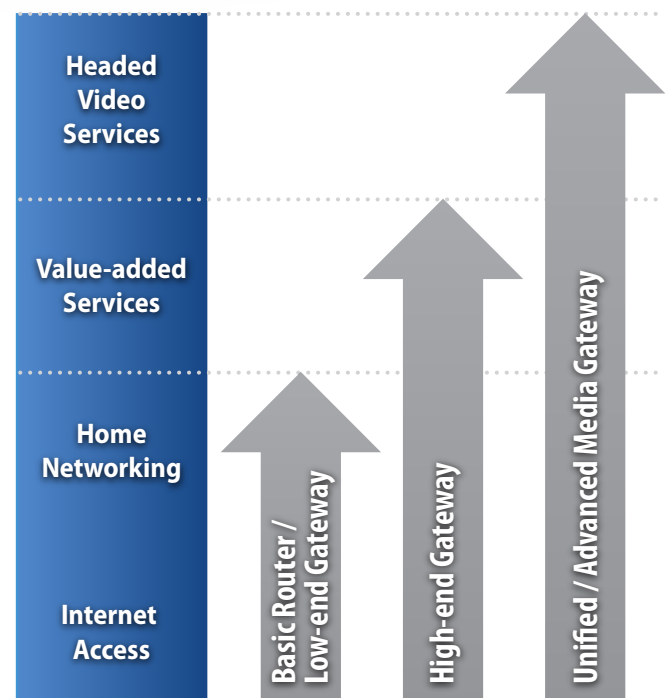
### Basic routers / low-end gateways

These CPE devices provide an access connection to the broadband provider's network and allow computers and consumer electronics to be connected to create a home network. Products in this category are characterized by limited functionality at a low price.

### High-end gateways

While offering the functionality of basic modems and routers, these systems offer more robust computing resources. High end gateways also include software and hardware that enables additional services and capabilities, such as VoIP and supporting IPTV services. These gateway devices are often deployed by cable and telco operators that seek to offer value-added services to their customers.

## Definition of Gateway Types



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Figure 2: Definition of Gateway Types

## Advanced media gateways

These gateways provide full triple-play functionality, including conditional access. Operators can deploy a single box in the home with all data, voice, TV and other functionality in a master CPE device. Also referred to as unified gateways, relatively few of these devices are in the market today, but interest is growing.



## Trends in Residential Gateways

The new generation of residential gateways continues its evolution to address operator's current needs. Several trends in residential gateway hardware and software impact the offerings that will come to market over the next few years.

### Hardware Trends

#### IMPROVED PROCESSING POWER AND ON-BOARD SoC FEATURES

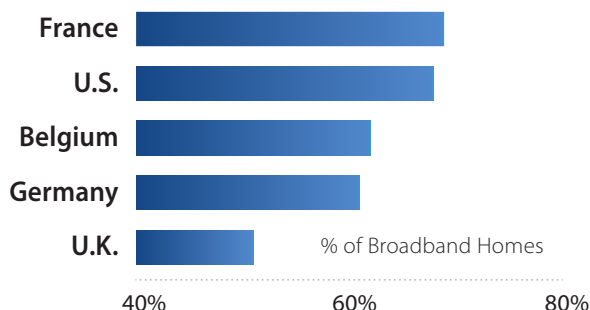
Advances in semiconductors allow newly designed gateways to support additional features and services at a lower cost than possible in previous years. The new generation of residential gateway system-on-a chip (SoC) processors packs a variety of features in silicon, including native support for connectivity standards like MoCA. Improved processing power provides more headroom for additional software applications, enabling operators to offer more software-based features, multiscreen support, and a host of new value-added services. Importantly, the costs for full-featured gateway processors continue to fall, allowing operators to deliver greater capabilities for the same cost.

#### CHANGES TO WI-FI

Wireless networking support is now table stakes for most gateway devices due to the great popularity of Wi-Fi networking among consumers. With the growth in mobile and portable connected CE devices, Wi-Fi has become a critical part of the "last mile" in many consumer homes. When Wi-Fi was first added to broadband CPE, many operators shipped gateways with basic Wi-Fi capabilities. The volume of Wi-Fi-related support calls then skyrocketed. Improvements in wireless network device management in the gateway and in client devices have helped, but Wi-Fi remains an area of potential support headaches for operators.

Many operators, most particularly operators with mobile networks, are adding fixed-wireless convergence capabilities to their residential gateways. Allowing consumer mobile phones to use the wired network (through a Wi-Fi connection) rather than the cellular network saves mobile carrier bandwidth and translates into lower mobile data costs for consumers. Some broadband providers are also adding support for more robust 802.11 standards (such as the proposed 802.11ac) and include both 2.4 GHz and 5 GHz radios in their gateway specifications.

#### Penetration of Wi-Fi Networks in Broadband Homes



Source: Residential Gateway Trends: Bringing Value Home  
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Figure 3: Wi-Fi Network Penetration

The greater bandwidth of the 5 GHz connection provides a better experience for video streaming to portable CE devices and can potentially allow operators to offer wireless set-top boxes such as those used by U.S. telco AT&T.

#### DESIGNED FOR CLOUD SERVICES

Triple-play providers are investing heavily in cloud-delivery technologies, enabling their offering of a variety of new services to consumers. As the industry moves to 1 Gbps speeds and beyond, broadband service providers see greater possibilities for cloud-based services. This approach to service delivery has a notable impact on the design of the residential gateway. Cloud-based storage allows operators to increase the storage capabilities of CPE without the additional cost of replacing the hard disk drive or the gateway itself. While storage for personal content and DVR content can be moved to the cloud, some local storage on the gateway remains necessary, particularly to accommodate the concerns of consumers that may not want personal content or information stored offsite.

With a robust network, user interfaces and transcoding can be delivered from the cloud rather than via the local hardware and software on the residential gateway. Support for future home monitoring, e-health, premium technical support, and other value-added services will be enabled through some combination of CPE-based functionality and cloud-based capabilities. For example, while the gateway serves as a hub for home automation sensors and controllers, features such as multiscreen interfaces, monitoring, and remote access capabilities may be provided via the cloud.

*The residential gateway will grow in importance as a necessary component in value-added service, helping operators derive additional ARPU from broadband customers.*

## MOVING FROM 2-BOX TO 1-BOX SOLUTIONS

Cable operators and telcos approach unification of CPE differently. Cable operators, which are adding broadband to their traditional strength in television services, seek to build value-added services on top of their DOCSIS 3.0-enabled high speed broadband access. Thus, feature-rich gateways are potentially appealing. UPC's Horizon box is one of the first unified gateways to be deployed; it offers a variety of features in support of UPC's triple play services. Similarly, telcos with fiber-based services have the broadband throughput necessary to offer a variety of services, providing them with an incentive to move to a single, full-featured box for their fiber services.

While technology and cost savings favor consolidation of the residential gateway and the set-top box into a single CPE device, the move to a unified CPE device has been slow. With most operators organized into separate broadband, video, and voice service silos, reaching consensus on device specifications alone (much less about which group will lead the effort) is a significant challenge. Having a single, master CPE box for the home results in a potential single point of failure, which is a legitimate fear among service providers. The majority of telco broadband connections are xDSL. DSL's more limited bandwidth makes delivery of IPTV, much less full triple-play, services problematic. Since the consumer's broadband connection is rarely near the television, a move to a unified box may result in additional installation costs. In some markets with low ARPUs, offering a high-end, single CPE device eats operator profitability and makes competition with low-end providers in these markets difficult.

Over time, however, as high speed broadband connections become more widely available and competitive pressures increase, cable and telco providers are likely to move to single box solutions. Greater competition will lead to downward pressure on broadband pricing, making the operational expense savings of a single box attractive. North America, which enjoys higher ARPUs, will likely be the leading global market for the emergence of unified gateways.

## Software Trends

### DIFFERENTIATION IS IN THE SOFTWARE

The source of differentiation among residential gateways is transitioning from hardware-based differentiators to software-based differentiators. In the past, vendors of gateway SoCs and gateway OEMs leaned heavily on hardware-based features to stand apart. Examples of hardware based differentiators include processing power, memory, security, and support for various connection standards. Gateway SoCs have added a significant array of on-board features. As a result, features that were once hardware differentiators are now common for many high-end gateways. Today, vendors place greater value in gateway software, creating software-based features to demonstrate innovation and attract the attention of broadband providers. Because the latest SoCs provide ample processing power, vendors can offer complex, feature-rich software that leverages the full hardware resources of the gateway.



### Software-based differentiation offers vendors several benefits:

- Software can be developed more quickly than hardware;
- Software is more easily adapted to client specifications or to emerging trends than hardware; and
- Experimenting with software developments is less costly than multiple hardware experiments.

In addition, unified middleware platforms allow applications to be developed once and deployed across a wide variety of hardware solutions. This maximizes the efficiency of development across multiple platforms. As a result of these trends, the variety of software-based services and features is greater than ever before.

### ADDITION OF VALUE-ADDED FEATURES

With growth in hardware capabilities and the move to differentiate gateways via software, operators are aggressively adding applications to enable gateways to support an array of value-added services. These services not only offer greater differentiation between broadband providers, but also provide a way for operators to increase revenues beyond those derived from their core broadband or pay TV services. As broadband and pay TV providers face saturated markets, this additional revenue will be key to corporate growth.

Several gateway-based value-added features are popular among operators and are being actively deployed in multiple global markets. Home automation, security, and energy services are areas experiencing broad deployment among operators in North America and Western Europe. Telcos and cable operators alike are adding support for cameras, motion detectors, door and window sensors, programmable thermostats, and control interfaces for mobile devices. These devices are often linked to cloud-based automation features such as optimization of appliance and HVAC use in the home to minimize the consumer's energy bills.

Storage and access of personal or professional content is also a popular offering. While many operators are adding cloud-based storage, a segment of consumers want their personal content to remain local, requiring that the gateway serve as a NAS device. Some gateways offer media sharing features that allow consumers to access content across connected devices. Others offer unified parental controls, enabling parents to set parameters once without having to install software on the client devices and to have those rules apply selectively across the viewing and computing platforms connected to the home network.

Many of these connected home offerings require an execution environment in the home, either via the residential gateway or a separate, dedicated hub designed for that purpose.

### IMPROVING HOME NETWORK MANAGEMENT

While the scope of features and services enabled by the residential gateway has increased, the gateway's role as facilitator in managing connected devices remains a priority. U.S. broadband homes have, on average, over six connected devices, a figure that grows each year. The diversity and complexity of these devices is also increasing, resulting in more calls from customers eager to connect these CE products to the Internet.

### Top Value-added Services of Interest to BSPs

1. Multiscreen services
2. Home automation
3. Home security / monitoring
4. Media sharing / remote access
5. Cloud storage
6. Energy management
7. Unified parental controls
8. Music streaming / downloads
9. E-health
10. Public Wi-Fi

Compiled by Parks Associates from interviews of BSPs and other industry players.

### Rainbow—Application Framework

Jungo's Rainbow is an application framework that serves as a platform for gateway-integrated services. Using Rainbow, service providers can independently develop new applications, modify gateway services on the fly, deploy and support unified applications across different CPE, and reach their entire installed base. Rainbow is an integrated part of Jungo's OpenRG gateway software and can also run on top of other gateway middleware.



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Software to support the TR-069 standard is now common in most residential gateways, and many gateway vendors build their own network management tools on top of TR-069 or add their own proprietary extensions to the standard to provide enhanced visibility into the digital home. Motorola, for example, includes a “home network discovery protocol” that allows operators improved discovery of devices on the network and provides real time details on the state of the home network.

Other features offered by various vendors include superior diagnostics, optimized flow of data to call centers, or graphical UIs. However, not all operators seem open to these changes. Some operators are hesitant to adopt proprietary solutions or extensions, fearing that these proprietary features will either lock them into a single vendor or hinder future interoperability.

## SOFTWARE DEVELOPMENT BEYOND THE HARDWARE OEM

Although all broadband providers dictate the software specifications for their gateway CPE, residential gateway hardware and software are often developed and provided by a single vendor. A number of operators now look beyond the gateway OEM for software. A few Tier 1 operators use their own internal development teams to create service applications or UI enhancements for their residential gateways. Other operators rely on third parties to either develop custom applications or to modify licensed software based upon the operator’s specifications.

Unified software is an important aspect of this trend for non-OEMs to create gateway software. Unified gateway software provides a common development environment that allows applications to be developed once for deployment across an operator’s often diverse set of gateway hardware platforms. Thus, developers are able to create gateway applications without having to have expertise on a particular hardware platform. The time between finalizing the project specifications and deployment of the application to enable a new service is also greatly reduced, saving not only time, but costs. Often, the gateway middleware that enables unified software is developed by independent software vendors (ISVs) like Jungo, the global market share leader in middleware among high end gateways. Rather than support a single hardware platform as is common in OEM-based software, Jungo and other gateway middleware vendors support the majority of popular gateway SoCs. Comcast is one of the few operators to undertake its own middleware development, creating the Comcast RDK and making the software open source. However, while the Comcast RDK provides common software architecture, it is not a full gateway solution. Operators using Comcast’s platform must still develop their own proprietary code for the RDK’s APIs so as to create a complete set of gateway software.

Further evidence of the decision to use more than OEMs for software development is the push by operators for open platforms and adherence to industry standards in software development. By insisting upon open platforms in their CPE software specifications, operators ensure that no single vendor holds them hostage via a proprietary development environment. Insistence upon a standards-based approach not only ensures greater interoperability, but also further protects operators from being tied to a single supplier. This approach gives operators greater control over their software, providing them with the freedom to perform development themselves or to have a third party do so.

### OpenRG— Residential Gateway Software



Jungo’s OpenRG, the world’s most widely deployed residential gateway software, enables the core functionality of the gateway while minimizing operator costs. With OpenRG’s hardware agnostic approach, service providers gain full flexibility in hardware selection while maintaining one easy-to-manage software base across all platforms and a capacity for rapid service introduction. This gateway software allows service providers to offer connected home services and extended digital home management capabilities, while improving the user experience and minimizing support costs.



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## REQUIREMENTS FOR GREATER FLEXIBILITY IN SOFTWARE

With the greater emphasis on value-added services and the increasing complexity within the home, the software for future gateways must be ever more adaptable and flexible. The gateway must be adaptable enough to accommodate interaction with and delivery of services to new types of devices that may not yet be available on store shelves. Security software, both in terms of content security and online security, must also be adaptable to address future threats to content rights and subscriber data. In addition, as new network tools that better monitor or enhance the customer experience will also become available, the gateway must accommodate these new tools without requiring a truck roll or the replacement of the CPE.

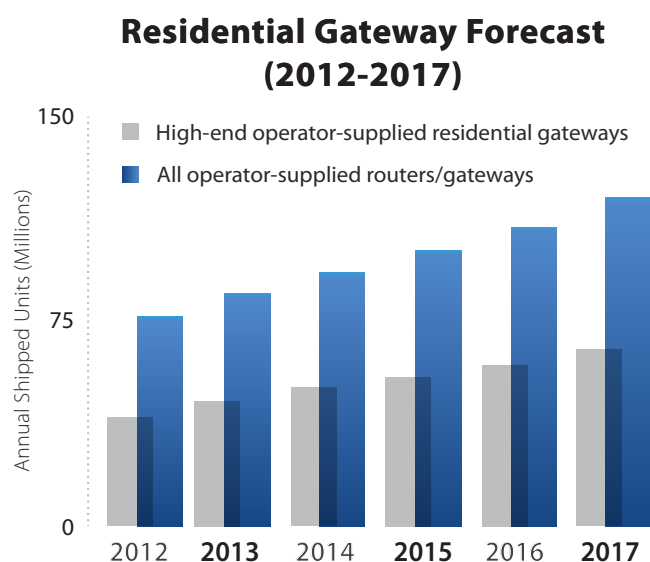
Operators in markets of high broadband penetration are rolling out a wide assortment of value-added services in an effort to increase ARPUs. Though some of these services may be cloud-based, many will leverage the computing, memory, or storage capabilities of the in-home gateway. While most of today's gateway middleware allows some degree of remote software updates, particularly for maintenance purposes, a current trend is for more robust features that allow operators to dynamically add and update features and services. In this environment, subscribers can potentially choose among a menu of services and features to customize the services available in their home. The gateway software must allow for the dynamic addition of new services as well as the ability for operators to change business models or service features.

## Size of the Residential Gateway Market

Broadband providers equipped their customers with over 75 million routers and residential gateways worldwide in 2012.

*That number will grow to over 120 million by 2017, providing a cumulative annual growth rate of 9.5%.*

(Figure 4)



Source: Residential Gateway Trends: Bringing Value Home  
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Figure 4: Residential Gateway Forecast (2012-2017)

High-end gateways flourish in areas with high broadband speeds from operators, multiple Internet-connected devices in homes, and an appetite for value-added services by consumers.

Diffusion of high-end, operator-provided gateways *will accelerate quickly*, with deployment of over 39 million devices in 2012 increasing to **65 million units** per year by 2017.

While OEM-based software is prevalent in high-end residential gateways, ISV software also remains a key component in gateway software.

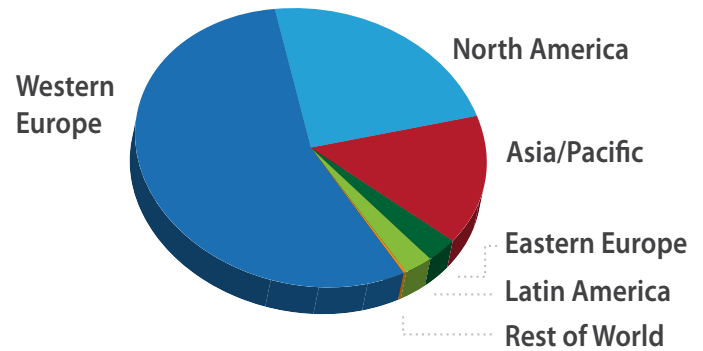
Today, Jungo is the largest provider of third party gateway middleware, deploying software in 25% of operator-provided high-end gateways.



With high broadband penetration rates causing an inevitable decline in growth rates and operators searching beyond core services for new revenues, North America and Western Europe are the largest global markets for operator-supplied high-end residential gateways today. 78% of the world's operator-supplied high-end residential gateways in 2012 were deployed within these two regions (**Figure 5**). Much of the rest of the world, particularly developing Asia, relies on basic modems / routers or requires the consumer to purchase the gateway themselves. The cost of CPE is a significant reason.

With extremely low ARPUs in these markets and with little demand for advanced services, broadband providers are hard-pressed to justify the expense of more full-featured gateways. However, the rapid adoption of broadband services and consumer electronics in Latin America and Eastern Europe makes those markets some of the fastest growing for residential gateways, with cumulative annual growth rates of 33% and 43% expected respectively between 2012 and 2017.

### Regional Share of Operator-supplied High-End Residential Gateway Shipments (2012)



Source: Residential Gateway Trends: Bringing Value Home  
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Figure 5: Regional Share of Operator-supplied High-End Residential Gateway Shipments (2012)

In terms of volume, the Asia/Pacific region will outpace the size of the North American market in annual shipments of high-end residential gateways by 2014, and continue growth to achieve 15.5 million annual shipments by 2017.

## The Future for Residential Gateways

As markets and technologies mature, the residential gateway will be a key component of operator CPE and as a tool for enabling new services. The industry can expect several gateway trends to play out in the future.

### Greater software complexity

Ultimately, the high end residential gateway and the unified gateway are becoming open, standards-based, multifunction platforms within the home. As OEMs offer greater processing power and enhanced hardware-based features within their products, residential gateways will have the resources to allow larger, more complex software applications to run simultaneously.

### A move to client-server architectures

Many set-top box OEMs are moving to a client-server architecture that uses a primary box that serves as a video gateway into the home and multiple thin-client boxes that rely on the primary box for content delivery and service features. Future residential gateways will ultimately adopt a similar approach. These gateways will deliver or facilitate the delivery of video and cloud-based services to client boxes or directly to connected CE devices.

## **The emergence of cloud-based services**

Operators will invest heavily in cloud-based services over the next few years. As a result, the hardware and software requirements for gateways will adapt to support these services. Future services will leverage the power of the operator's network as well as the hardware resources and software capabilities of the residential gateway.



## **Addressing transcoding and video**

Transcoding of video to allow video streaming to various screened devices will be an important area addressed by operators. At the same time, transcoding will require operators to make difficult cloud-gateway tradeoff decisions. Cloud-based transcoding offers the benefit of access to video services within and outside of the home network. However, this approach requires a robust network and adequate throughput. Adding transcoding capabilities to the gateway offers potentially better video performance, allows streaming of locally-stored personal content, and mitigates low performance broadband infrastructure. Adding these capabilities, though, adds to overall gateway cost.

## **Operator and third party software development**

The trend towards non-OEM software development will continue. Ultimately, third party companies will emerge that develop specialized value-added service software applications, which operators can license and, after validation, roll out to subscribers. For example, some of these offerings may include in-home health monitoring, remote health services, or elder care that are too specialized for a broadband provider or gateway OEM to develop, but are of interest to paying subscribers. So, the future gateway will have the flexibility to support a variety of services enabled via software developed by any party.



Jungo is a leading provider of software solutions for home broadband services. Jungo's industry leading home gateway middleware is the heart of millions of gateways, deployed by top broadband service providers and CPE manufacturers worldwide. Jungo's hardware-agnostic gateway middleware easily integrates with any existing or future selected platforms, regardless of the CPE hardware types and vendors.

Jungo's unique solutions enable service providers to accelerate the introduction of a variety of innovative, revenue generating digital home services, while enhancing their competitive edge and reducing operational costs. Jungo is a part of the NDS Group, the world's leading supplier of technology solutions for pay-TV service providers. Together, the companies offer a complete software solution for the digital home. [www.jungo.com](http://www.jungo.com)

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The company's expertise includes new media, digital entertainment and gaming, home networks, Internet and television services, digital health, mobile applications and services, consumer electronics, energy management, and home control systems and security.

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Brett has spent over eighteen years in the industry as an analyst, executive manager, and entrepreneur. Previously, he founded and served as vice president for Teligy, a software company specializing in software for wired and wireless communications systems. Brett established new divisions for networking and audio/multimedia software for Intelligraphics. He has also been involved in the development and marketing of early-market products for 802.11 wireless networking, VoIP, and other technologies. Brett holds an MBA from the University of Texas at Austin with a concentration in high-tech marketing and a BA in physics from Baylor University.

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