



MARKETING REPORT

MR-239

**Broadband Forum Value Proposition for
Connected Home**

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Executive Summary

The Broadband Forum (BBF) is the leading industry organization developing standards for managing broadband services and associated devices. MR-239 outlines the value proposition BBF brings to Service Providers and consumers to enable the next generation family of value-added managed services for the Connected Home, such as Home Monitoring, Control, Security, Media, Health, Energy management, and others via its evolving set of recently updated Technical Report TR-069 standard enhancements, including Software Module Management, ACS Northbound Interface Requirements and future enhancements such as management of non-TR-069 Devices and others.

Broadband Forum at a Glance

- Established in 1994.
- Develops multi-service broadband specifications.
- Addresses interoperability, architecture and management.
- Mission: to enable home, business and converged broadband services, encompassing customer, access and backbone networks.
- Over 500,000,000 Customer Premises Equipment (CPE) devices are currently deployed in the field. The managed devices utilize the global industry leading TR-069 protocol & associated data models.
- Developed more than 100 Technical Report (TR) specifications (as of 2010). Some of the TRs currently relevant to The Connected Home are depicted in Figure 1.
- More than 180 active membership of service providers, and core technology, software and device vendors.

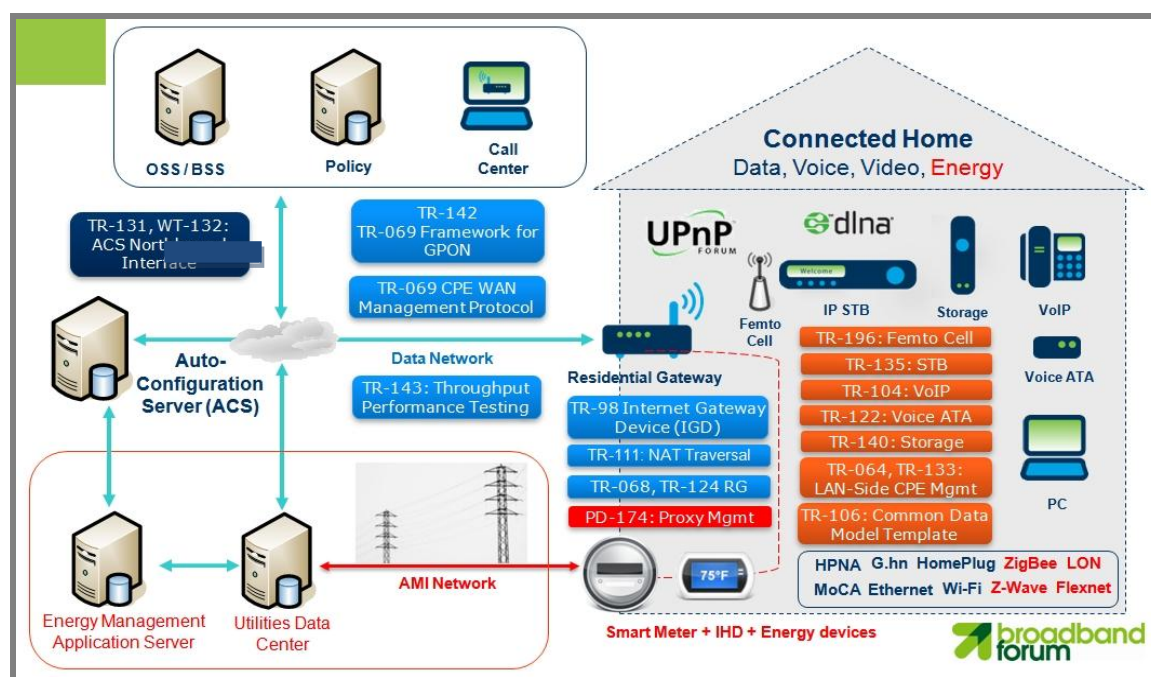


Figure 1 Broadband Home Standards Overview & Extensions

1 Introduction

The purpose of this White Paper is to outline the emerging Connected Home market and the value proposition of Broadband Forum for Service Providers and consumers.

MR-239 describes the Connected Home today and where it is evolving:

- the state of the market,
- the market potential for the Connected Home services,
- value proposition of the Broadband Forum in the Connected Home,
- examples of managed the Connected Home services,
- managed devices and why they matter for deployment, and
- which standards should help efficient and profitable deployment of Connected Home services.

2 The Connected Home

In the last few years, traditional triple-play services have been commoditized and this resulted in significant revenue reduction for Service Providers triggering a search to replace the lost revenue.

The Connected Home space is quickly becoming a major opportunity and turning into the focal point of Service Providers' interest to offer additional revenue-generating value-added services to consumers.

The Connected Home typically includes the following components.

- A managed Residential Gateway inside the home
- Ecosystem of devices inside of the home that might be using various underlying connectivity technologies but are controlled and managed in technology agnostic way. [4]
- Broadband connection to the Internet via the Service Provider's managed network
- Auto-Configuration Server (ACS) management system that allows the remote management of CPE Management Protocol (CWMP) enabled CPE devices such as the Residential Gateway, Set Top boxes, Storage devices, communication devices etc..
- Operation and Business Support Systems (OSS/BSS) of the Service Provider that provide functionality such as the monitoring of the service and network, provisioning and billing.
- Value-added Services and associated devices inside the Connected Home

Connected Home Services are usually described as web based cloud services that provide consumer applications, delivered over a broadband Internet connection, to various in-home devices. These services provide comfort, security, convenience, entertainment, healthcare and other services with overall awareness to consumers. The Connected Home Services are accessible through multiple user-friendly interfaces including mobile phones, Web browsers, tablets, and TVs. Examples of such services include Energy Management, Home Control, Home Monitoring, Home Security and Home Health.

3 Service Provider View

The Service Provider provides the end user with a connection to the Internet. The Service Provider deploys a Residential Gateway, a central, always-on, always-connected device and always available.

Figure 2 shows the Connected Home composed of devices which connect the home network utilizing various technologies such as Wi-Fi, Ethernet, Powerline, HPNA, Z-Wave, Zigbee and DECT. The need for more bandwidth, interoperability, and Quality of Service (QoS) is driving the use of emerging technologies such as MoCA and G.hn.

Device trends such as set top boxes and video displays are leading the increase of Internet connectivity and demand for bandwidth needed for HD and 3D.

New Internet-based services, remote access of devices, home health, monitoring and energy services, will pass through the service provider's residential gateway (RG). The position of the RG provides the service provider a point where services may be deployed, rather than being a mere bridge. This point can also be used for media servers, home management & support, and allows the service provider to further take advantage of the new service opportunities.

As the Connected Home increases complexity, service provider supported remote management of the Residential Gateway and home network devices will enable the seamless integration of Connected Home services for customers. The service provider will support remote management through to a broadband network via management servers.

Figure 2 represents the structure and relations between devices, services and networks at the high level.

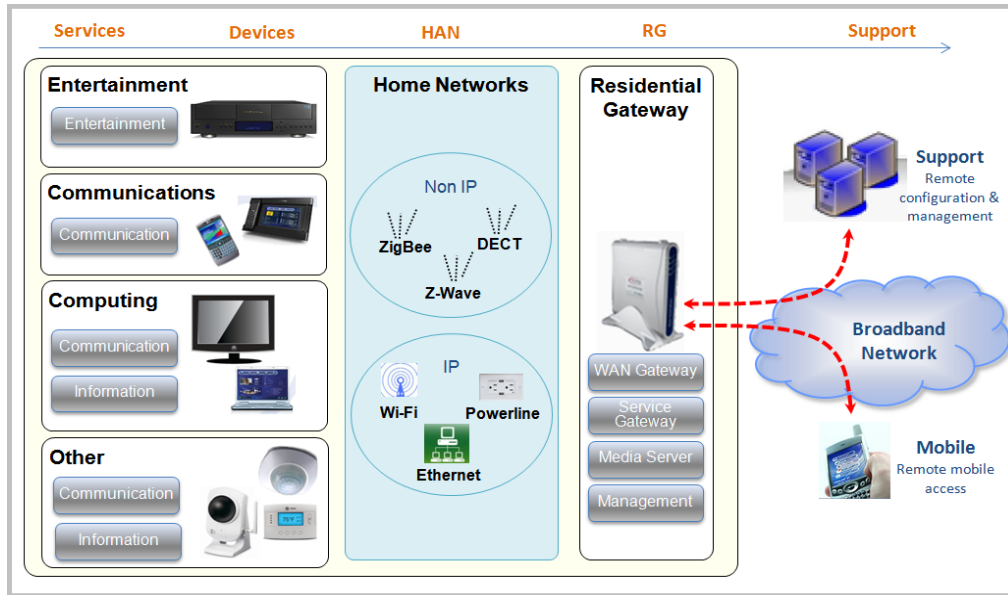


Figure 2 Digital Home – Service Provider View

4 Market size for Connected Home Services

There is a significant global market opportunity for Connected Home services, illustrated in Figure 3 with projections using Compound Annual Growth Rate (CAGR):

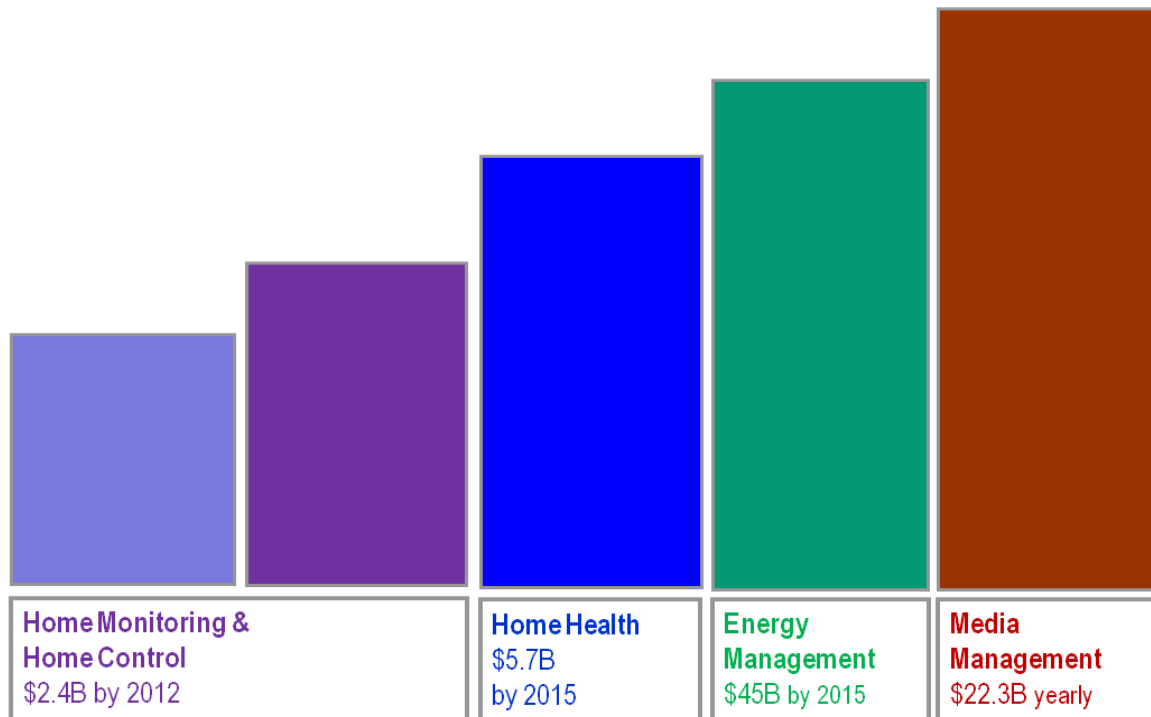


Figure 3 Connected Home Services Market Projections

- **Home Control / Home Monitoring:**
 - Frost & Sullivan estimates that the North American Home Automation Market will reach \$2,442M by 2012.
- **Home Health:**
 - Parks Associates estimates that the total market for Digital Home health services in U.S. alone is expected to grow to \$5.7B in 2015, , which represents a five-year CAGR of 28%. Total users that will benefit from digital health solutions will increase to 26 million, a significant jump from an estimated 3.8 million in 2010.
- **Energy Management:**
 - According to ABI Research, the World Market forecast for Smart Grid spending will top \$45B by 2015.
- **Media Management:**
 - According to Ramp Rate Media management market is \$22.3B yearly with a CAGR 23.1% .

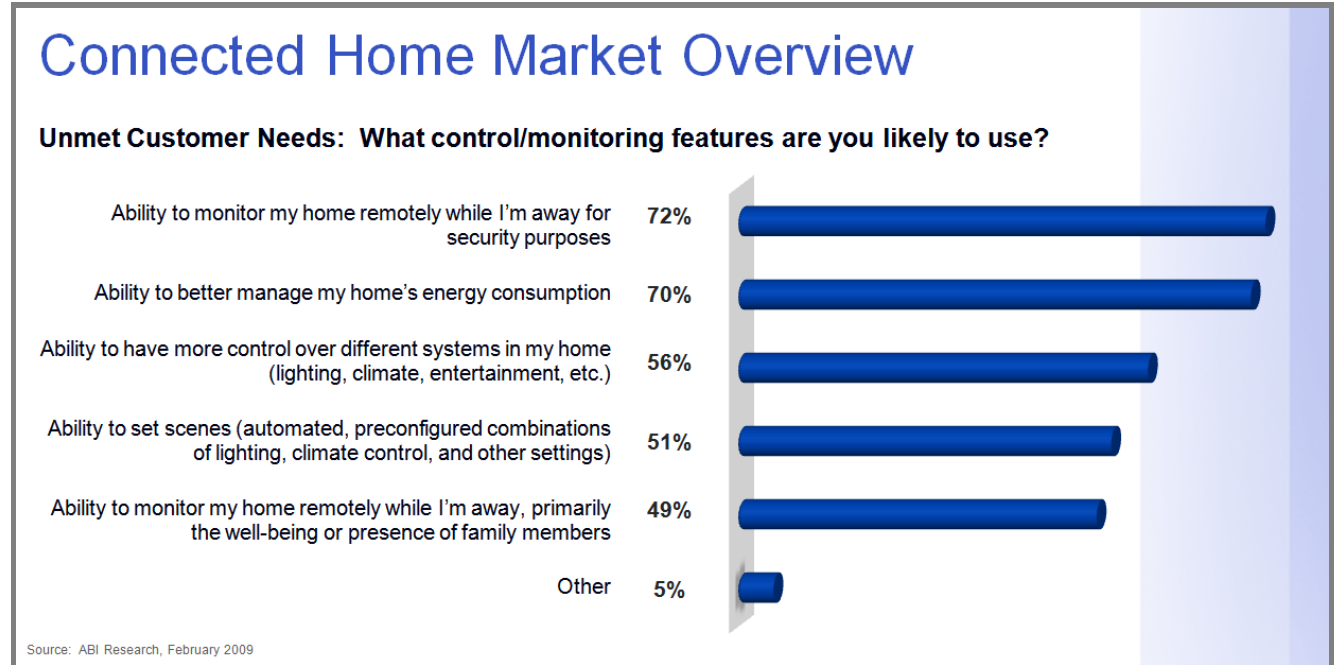


Figure 4 The Connected Home Market Overview

Many market researches, as shown in Figure 4 from ABI Research, indicate that consumers are interested in the majority of use cases / scenarios that can be offered via Connected Home services.

Three important trends have come together, making Connected Home Services a logical evolution of the Consumer portfolio for Service Providers:

1. Ongoing improvements in installation process and overall usability – substantial improvements have been made not only in user interface software but also in hardware devices within the home to make it simple to install and easy to use.
2. Continued downward pressure on hardware pricing – “starter kits” became much more affordable, dramatically improving the business case.
3. Increasing acceptance of technology in everyday life – families of all profiles continue to demonstrate their willingness to bring more and more technology into their homes to make their lives better and more convenient.

5 Value Proposition to Service Providers

The Connected Home has all the prerequisites to become an emerging technology for mass deployment in the immediate future. It is present on many service providers' roadmaps and many programs are underway to meet this target.

The value proposition for service providers includes but is not limited to:

- Revenue from providing more managed services
- Revenue from providing more managed devices
 - Direct and via partnerships with vendors
 - Many new services Starter Kits
- Up-selling basic Broadband triggered by new services addition
- Reducing support cost and TCO (Total Cost of Ownership)

In addition to new revenue streams, Connected Home services are very “sticky” and help to increase consumer loyalty while decreasing subscriber churn.

6 Value Proposition to Consumer

In the last decade some of the Connected Home related applications, such as home automation, were introduced to the market, mostly by integrators to fairly narrow segments of the market and the overall results were mixed. In particular, the user experience was not simple, most of the deployments were done via highly-customized, expensive professional installation and overall volume of deployed services was quite low.

As underlying the Connected Home technologies mature and the cost of devices goes down there is growing momentum to expand such applications and take them to the next level, in particular build missing higher-level standards and therefore propose much stronger value to the consumer. The value proposition to the consumer includes but is not limited to:

- Variety of services for the Connected Home with a rich set of functionalities;
- Green lifestyle enabled by energy management service that saves energy, cost and environment;
- Simple do-it-yourself (DIY) installation accomplished via standards-based Plug-n-Play or easy pairing of new devices;
- Simple configuration and operation;
- Services that come along with or as add-on to the basic broadband connection;
- Reliable standards-based approach that allows easy expansion and addition of new devices;
- Upgradeability to enable new features;
- Service level change such as increased broadband rates for streaming devices;
- Consistent user experience by managing multiple services via one framework;
- Easy problem resolution via remote support which increases customer satisfaction.

7 Managed Services

7.1 Home Energy Service

The rollout of smart meters around the world is depicted in Figure 5. This rollout introduces a new opportunity for the Broadband industry to integrate Smart Grid and the Connected Home into one unified system for consumer's benefit.

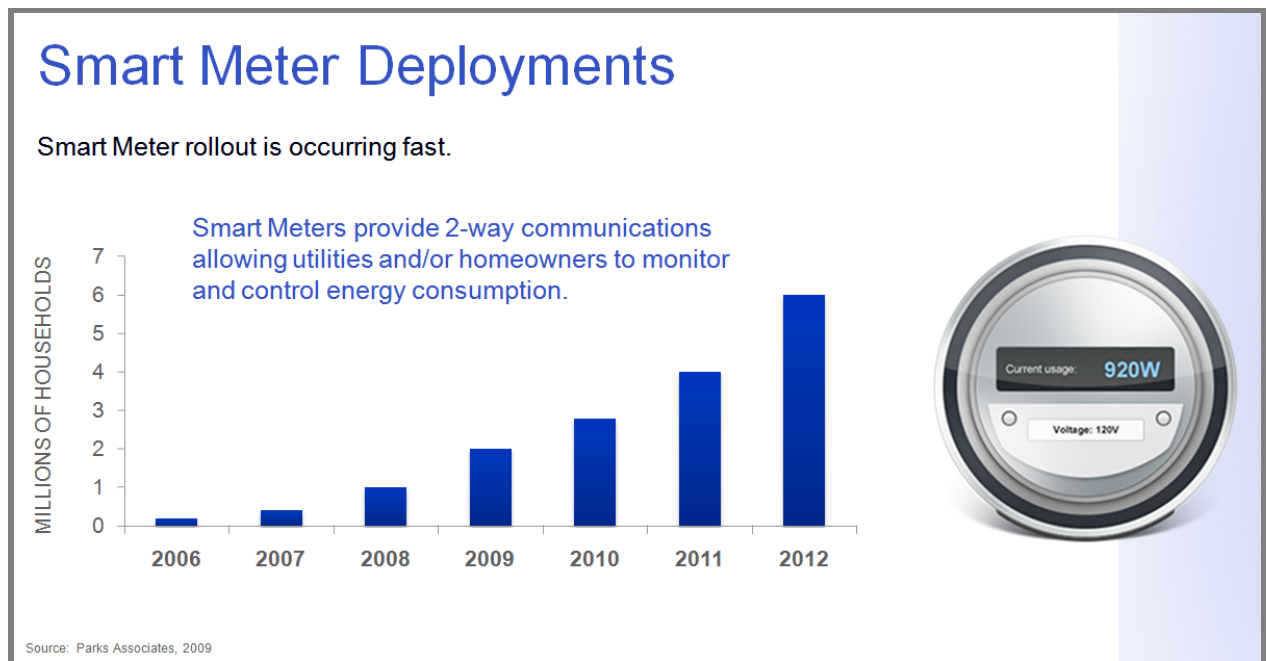


Figure 5 Smart Meter Deployments

This can be accomplished via introducing consumer-facing energy management service that allows consumers to monitor and analyze energy consumption readings from a Smart Meter (both utility and retail provided) as well as individual energy modules. It optimizes energy usage using device management, a recommendations engine, notifications, tracking historical trends and overall awareness.

The ultimate value comes from the combination of energy management and home control services that allows full management: proactive energy use suggestions, automation; integration with smart meters for demand-respond management either driven by utilities or consumer. The energy management service provides the consumer a reduced energy expense.

There are multiple ways to deliver notifications and alerts to the user upon such events that include email, Short Message Service (SMS) to one or more mobile phones and Instant Messaging. Notifications include the information about the event, link to the User Interface

and other customizable information, so the user is always promptly and comprehensively informed about what is happening while being away.

Home Energy Service key values:

- Remote internet servers connect via broadband enabled Residential Gateways to Smart Meters (both Utilities provided and Personal all-home energy readers) providing the consumer with home energy consumption at three levels
 - Awareness
 - Monitoring
 - Management
- Heating Ventilation and Air Conditioning (HVAC) monitoring and control via Programmable Thermostats (PCT)
- Controlling multiple energy sources, e.g. Solar panels in addition to traditional ones
- PEV (Powered Electrical Vehicles) charge / status management
- Load control modules for measuring consumption from individual devices
- In-home energy displays for consumer-friendly monitoring and control
- Demand-response applications that allow energy reduction during peak hours
- Data collection and tracking Historical Trends
- Generation of reports, Budgeting
- Alerts, notifications and other user messaging based on events.

7.2 Home Security Service

Home security service allows consumers to monitor the security of their homes locally and via Internet powered remote Services. Services that provide access to the Alarm Panel and associated sensors installed throughout the home, arm and disarm the system both manually and based on the schedule, receive notifications and alerts, integrate with other Home monitoring and Home control devices.

The home security service monitors various sensors such as motion sensing, flood detecting, smoke detecting, gas detecting, entry detecting etc. These activities may be used by a support organization to monitor and alert the consumer.

7.3 Home Monitoring Service

Home monitoring service provided over a broadband connection allows consumers to monitor and manage IP cameras, giving them full control of the videos – they can stream live video, record it to local and remote storage, manage camera streaming options, share IP cameras and recordings.

This service can be provided to the consumer while at home or from a remote location. The Home monitoring service powered by the RG connecting to the IP cameras streaming video

to remote Internet servers allow functions such as playback, searching, tagging, motion sensed recording and saving recordings to the server.

Additionally the consumer may schedule recordings, receive notifications about events, manage various conditions such as “Home”, “Away” etc. This service gives the end user the ability to feel secure about their home when they are on vacation, at work, or anywhere else.

7.4 Home Control Service

Home control service allows consumers to control lights, appliances, HVAC systems & thermostats, motion detectors, access contacts (such as door and window sensors), powered shades and blinds, door locks, lights, appliances, thermostats, and a variety of other home devices compatible with a variety of supported standards that are not interoperable. Home automation controls were once limited to at-home use and the high end of the market. The next generation home automation is powered by a broadband based service that allows home automation to enter the mainstream market and to be used both at home and on the go.

Home control services allow the user to customize their home automation by creating scenes (controlling many devices). Home Control services may utilize, event based and timer based services to invoke control actions on multiple devices such as turning off power, adjusting lighting, run scenes based on time of day, motion detection and other events.

7.5 Media Management Service

The media management service allows consumer to organize access locally and over the broadband connection, manage, playback, backup and share various types of media files through DLNA and other rendering services over multi-displays in a seamless and friendly way within their Connected Home experience.

7.6 Home Health Service

Home health, also referred as TeleHealth, is a fast-emerging market offering: letting patients remain home, having patients and clinicians work together to achieve best outcomes. The patient may be viewed remotely over a broadband connection by a physician or a family member. The service will allow tracking of health status as well as enabling social networking and ability to setup individual preferences for variety of managed devices. An example of a Home Health user interface is depicted in Figure 6.

Home health service key values

- Independent living: remote support for elderly people;
- Wellness monitoring: health condition tracking and consumer interface;

- Connecting health devices to the consumer's home network;
- Emergency support: alerts and notification upon alarming events;
- Recommendations based on collected health data;
- Trend analysis based on collected health data;
- Family portal to allowing remote support from family and caregivers;
- Proactive notifications and recommendations to consumer.



Figure 6 Home Health User Interface Example

8 Managed Devices

Managed services typically require managed devices that are installed at the customer premises and operate as essential service enablers. Manageability of such devices is critical for provisioning, lowering Total Cost of Ownership (TCO) and efficient problem resolution, including proactive approach. Managed services are critical to enhanced consumer experience and improved perception of Connected Home Services

Broadband Service Providers provide a unique central point for managing all devices within the home, in order to troubleshoot problems that may be connectivity or multiple device related. Management through the Broadband Forum's CWMP protocol (TR-069 [2]) provides a secure connection based on web services to managed devices.

Remote Management provides an instant, deterministic value added service to access devices to provide provisioning, reboot, reset, upgrade, monitoring, statistics collection, and configuration without human intervention.

All devices that are associated with a service would benefit from a remote management service. Broadband Residential Gateways can be enabled to support management extensions to non-IP devices.

To provide an easy consumer installation, managed devices usually come in a starter kit to provide seamless installation and user guide to the devices:

- Basic starter kit makes service installation quick and user-friendly
- Additional devices can be sold via retail or web store as “compliant” supplements
- Service providers and/or their Integrators might establish certification program to qualify more devices for the portfolio to increase revenue and avoid field issues.

9 Broadband Forum Work

The Broadband Forum has developed many fundamental standards for end-to-end management.

Broadband Forum's CPE WAN Management Protocol (CWMP), more commonly referred to as TR-069, is the main management tool behind the enabling of new services and remote management of CPE including Residential Gateways and other Connected Home devices.

Recent updates in remote management through CWMP provide an essential building block for launching new services with the software modular management capability. This capability provides a mechanism for service providers to download new services on existing and new managed devices.

In addition to TR-069 the Broadband Forum released the following:

ACS Northbound Interface Requirements:

- Deployment of new value-added services implies integration with other Service Provider hosted systems
- Covers high-level requirements for northbound integration with OSS / Order Management Systems (OMS) / Customer Relationships Management (CRM) Systems.

Currently there are multiple projects in progress that are intended to expand support for the value proposition for the Connected Home. They include the following:

TR-069 protocol updates:

- Management of non-TR-069 devices is work in progress to insure the concept of TR-069 management beyond the CPE that allows a “proxy”-style management of IP and non-IP non-TR-069 devices residing at the customer premises has a complete solution set.
- Future extensions for managing a variety of interfaces and new devices found in the Connected Home.

MR-204, *Energy Efficiency, Dematerialization And The Role Of The Broadband Forum:*

This white paper established the Broadband Forum’s role in energy efficiency and energy reduction for the Connected Home. In particular, MR-204 [1] covers remote management of CPE and devices in the home, outlines cascaded energy management via new proxy management capabilities and describes new works to transition the behavior of broadband from “always on” to “always available.”

10 Conclusion

In order to deploy value-added services for fast-emerging Connected Home market in efficient and profitable way it is imperative to have both services themselves and associated devices managed in a standards-based way. To protect the customer's privacy, permission may be required when subscribing to Connected Home services. Management access to the services and devices for providers and application access for consumers must be clearly demarcated.

The Broadband Forum has already created the foundation for such deployments via its world-leading TR-069 standard / CWMP protocol and TR-106 [3] based data models and is actively pursuing new extensions of these standards for the Connected Home market and opportunities.

The combination of the CWMP family of standards mentioned in this document brings even more value than each of them individually. For example, combination of proxy-management and software management brings the complete solution for enabling and managing new services that involve installation of starter kit at the customer premises.

The Broadband Forum works in close cooperation with service providers and hardware, software, and core technology vendors to ensure timely releases of such standards for the benefit of its members.

Definitions and Abbreviations

3D	Three Dimensional
ACS	Auto-Configuration Server
ADSL	Asymmetric Digital Subscriber Line
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
BBF	Broadband Forum
BSS	Business Support System
CAGR	Compound Annual Growth Rate
CPE	Customer Premises Equipment
CWMP	CPE Management Protocol
CRM	Customer Relationships Management
DLNA	Digital Living Network Alliance
DR	Demand Response
EE	Execution Environment
EM	Energy Management
HAN	Home Access Network
HD	High Definition
HVAC	Heating Ventilation and Air Conditioning
IP	Internet Protocol
IPTV	Internet Protocol Television
ISP	Internet Service Provider
LAN	Local Area Network
MD	Marketing Document
OMS	Order Management System
OSS	Operations Support System
PEV	Powered Electrical Vehicles
PCT	Programmable Communicating Thermostat
QoS	Quality of Service
SP	Service Provider
TCO	Total Cost of Ownership
TR	Technical Report
UPnP	Universal Plug-and-Play

References

The following references are of relevance to this Marketing Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Marketing Report are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

A list of currently valid Broadband Forum Marketing and Technical Reports is published at www.broadband-forum.org

Document	Title	Source	Year
[1] MR-204	<i>Energy Efficiency, Dematerialization and the role of Broadband Forum</i>	Broadband Forum	2009
[2] TR-069	<i>CPE WAN Management Protocol</i>	Broadband Forum	2010
[3] TR-106	<i>Data Model Template for TR-069-Enabled Devices</i>	Broadband Forum	2010
[4] Series Y, Supplement 8	<i>Supplement on global ICT fora/consortia survey</i>	ITU-T	2010

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