



White Paper:

***How ClimateTalk™ Open Standards
Complement Smart Grid Objectives***

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How ClimateTalk Open Standards Complement Smart Grid Objectives

This paper outlines a powerful value proposition that the ClimateTalk™ Open Standards bring to the Demand Response objectives of utilities and the Smart Grid by defining how major energy consuming equipment and appliances within the Customer Domain or home respond gracefully to peak load-shed reduction commands.

Abstract

There has been a global effort over the past several years by both utilities and government agencies to build out “Smart Grids” as a means of increasing the reliability and manageability of the electrical transmission and distribution infrastructure. More recently, the focus has shifted to reducing the demand on the grid as a way to manage, balance, and predict power generation requirements, especially during peak periods. The vision is that this is going to be achieved through peak load Demand Response services, the availability of real-time and time-of-use pricing information to consumers, consumption data collection via intelligent meters, usage pattern predictions, Home Energy Management Systems, and pricing model incentive plans.

Currently, water heaters and Heating, Ventilation, and Air Conditioning (HVAC) systems use over sixty percent of the energy in the home. Unfortunately, most of these appliances are not communication ready and, therefore, are not interconnected. Because appliances tend to have a ten to fifteen year life cycle, the industry has put an emphasis on building a “Smart Grid ready” intelligent network out of these not-so-smart devices.

Open application, interconnection, and interoperability standards are essential when addressing this fundamental problem of adding communication capabilities to these devices for machine-to-machine control and monitoring. At the same time, there is intense pressure to develop open and interoperable standards that enable seamless integration with automated Demand Response and Home Energy Management (HEM) solutions.

ClimateTalk Open Standards define a framework for interoperable solutions that provide advanced automated control for those devices. These Open Standards meet the unique requirements of the residential ecosystem by addressing the needs of control suppliers, Original Equipment Manufacturers (OEMs), contractors, and, most importantly, homeowners.

With an emphasis on application profiles for automated system control, ClimateTalk supports graceful execution of Peak Load Shed requests as an extension of the ongoing standards development within the Smart Grid industry working groups. By laying a foundation for innovation, connectivity, improved information access, and ongoing energy savings, the ClimateTalk Open Standards, when paired with the Smart Grid standards, combine to provide a very compelling return on investment for these connected solutions. This also helps drive the homeowner’s participation, a key success factor for the Smart Grid as a whole.

Introduction

Today, ClimateTalk Open Standards are reducing the complexity of installing, operating, and troubleshooting high-efficiency HVAC systems. Members of the ClimateTalk Alliance are expanding Standards to provide advanced control, enriched user interfaces, performance analysis, and diagnostics for other machine-to-machine applications such as zoning and water heating. This open framework of application standards provides a foundation for an ecosystem of interoperable smart appliances and elevates the capabilities of the predominant energy consumers within the home. In addition, this foundation provides a path for the major energy consumers in the home to support the objectives of the Smart Grid efforts with innovative, cost effective, and robust solutions that enhance the value of being connected.

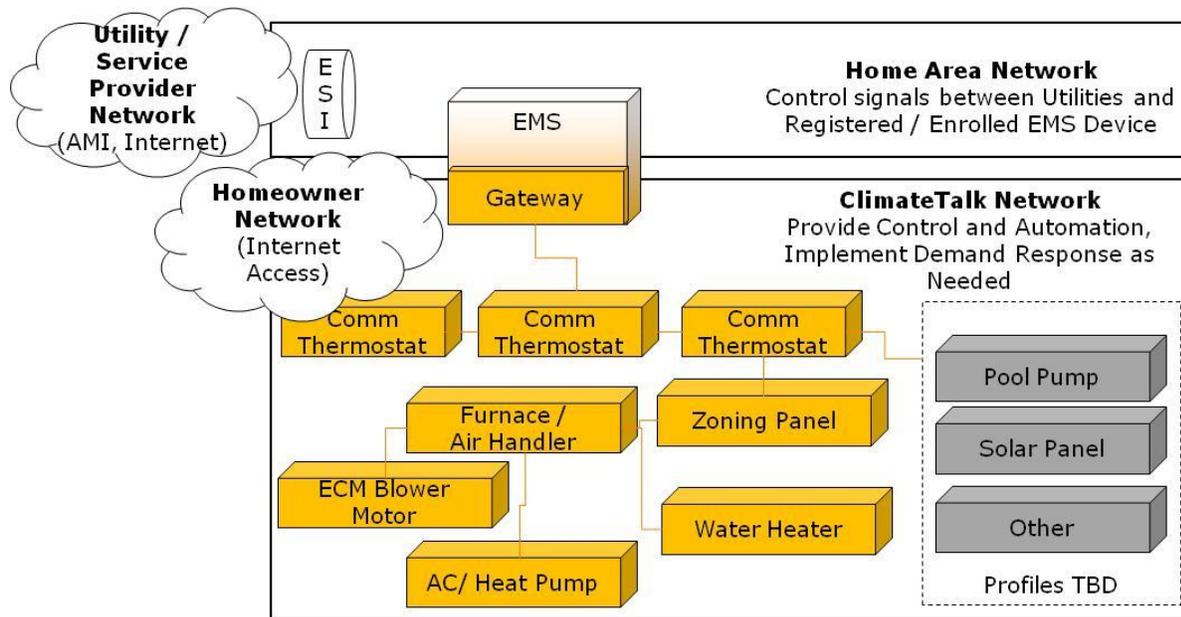
As a result, the ClimateTalk Open Standards provide the fundamental elements to support the success of the Smart Grid in the following areas:

- *ClimateTalk Provides a Single Point of Contact* for load shed requests to reach the connected devices. Leveraging the capabilities of an associated Energy Management System (EMS), this simplifies the configuration and security requirements normally encountered when connecting individual appliances directly to the Smart Grid.
- *ClimateTalk is a Framework for Interoperability* between the major subsystems in the home's ecosystem. This framework provides a standardized development interface when choosing the most appropriate networking technology within the home.
- *ClimateTalk is Innovative* and is architected for a world of hybrid solutions requiring multiple communication mediums. It provides a simple, low-cost development framework for seemingly disparate devices that otherwise would not be able to communicate within the home, much less out to the Smart Grid. ClimateTalk has the added benefit of supporting automation, control, and diagnostics for enriched user information access and experience.
- *ClimateTalk is Relevant* to the Smart Grid because the industry experts responsible for manufacturing the appliances that consume over half the energy within the home developed and are supporting it. Products designed to the ClimateTalk Open Standards already are demonstrating the influence an open standard brings to the industry. In addition, the Alliance members have established the training, support, and service channels necessary to make connecting to the Smart Grid successful.

ClimateTalk Provides a Single Point of Contact

With ClimateTalk Open Standards, devices that traditionally have stood alone can now be a part of the connected home with new levels of control and enhanced user interactivity. The ClimateTalk network acts as the conduit for Demand Response commands without the burden of managing the security and registration requirements of individual nodes connecting directly to the Smart Grid.

To use the human body as an analogy, one could view the Smart Grid as the brains behind the home's ecosystem - with the hands and feet doing all of the work. Those hands and feet are the systems in the home that run on electricity. To continue the human body analogy, ClimateTalk is the nervous system that transports messages both between the grid and the home's electrical systems and between the devices themselves. ClimateTalk acts as the Smart Grid's command interpreter when communicating with the home's electrical systems and devices.



ClimateTalk Open Standards are the common “language” for machine-to-machine command and control signals. A unified language means that the Smart Grid does not need to speak “water heater,” “air handler,” or “condensing unit.” It simply delivers a load shed or price message to the EMS device and ClimateTalk delivers that message to all of the connected home systems. The result is an optimized energy management system that communicates reliably and efficiently.

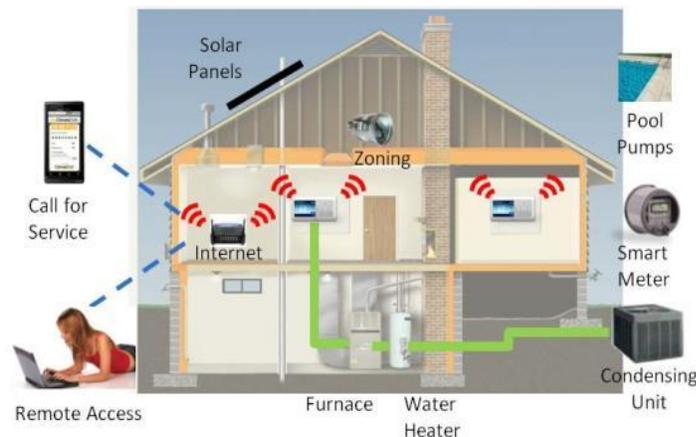
Requiring the Energy Services Interface (ESI) or Smart Meter to “talk” directly to each appliance puts a large burden on the device manufacturers. If the only benefit is load shedding during peak hours, the return on the investment for adding communications capabilities to legacy equipment is minimal. It may even have a negative impact on customer opinions of their products if the devices do not appear to be working properly during peak load conditions. Enabling an EMS device with ClimateTalk minimizes the security overhead and hardware resources required for each device on the network because they do not need to incur the additional resources required for connecting directly to the Smart Grid themselves. The ClimateTalk platform also enables enhanced user interfaces and provides enriched system and performance information, thus delivering additional value to the homeowner and OEMs.

Finally, by enabling equipment with serial communications, devices on a ClimateTalk system are capable of engaging in a two-way exchange of information. As such, ClimateTalk-enabled applications provide more value to the Smart Grid by confirming the reduction of the load or that equipment actually was shut down. With ClimateTalk acting as the universal language, this is accomplished through a single connection point.

ClimateTalk is a Framework for Interoperability

For the majority of HVAC systems installed today, there is a level of interoperability available using the existing legacy wiring standard. Thermostats have from four to eighteen terminals that correlate to the specific input requirements of indoor and outdoor HVAC units. However, individual on and off signals over a fixed number of wires is very limiting. The HVAC market is at the point where it needs a serial communications standard to open the doors to more innovative solutions and increased system efficiency. ClimateTalk defines that new standard – a serial communications standard. This ClimateTalk serial standard enables the level of interoperability the HVAC market cries for today.

Home appliances have never been challenged to be interoperable. The ClimateTalk architecture extends these communications capabilities to other home appliances and affords a framework for interoperability to any device that needs to be connected. Air conditioners really do not need to know the performance of the refrigerator or if the water heater is on or off. The refrigerator probably does not need to know what the furnace is doing either, but having a common connectivity standard does take much of the complexity out of realizing the dream of a fully connected and managed home.



Enabling a connected home poses challenges brought about by the competition for the vast residential market in addition to satisfying the unique needs of the differing ecosystems within the home. HVAC, white goods, lighting, and A/V systems have varying data rates and connectivity requirements.

Establishing an interoperability framework for machine-to-machine control across all of these products cuts down on the complexity of connecting these multiple ecosystems together for a fully automated home.

Implementation costs, the simplicity of wireless connectivity, and powerline-based solutions all are reaching suitability for the residential market. There is intense competition among the different protocols, each offering different benefits with regard to reliability, complexity,

capabilities, and cost. This competition is healthy, drives those costs down, and increases customer acceptance.

Unfortunately, the lack of interoperability among the various protocols adds yet another degree of complexity in an already fragmented market. So, rather than force the market to choose one solution, ClimateTalk allows for a choice of protocols.

What is unique about the ClimateTalk Open Standards is the ability to leverage established communication protocols today while still providing a path to the interoperable solutions of tomorrow.

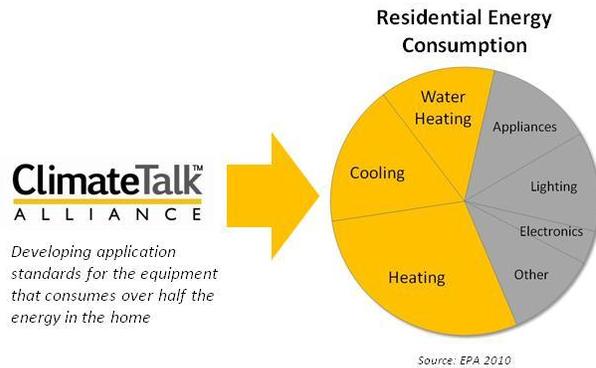
ClimateTalk is Innovative

The architecture of the ClimateTalk Open Standards brings a Universal Serial Bus (USB) “Plug-N-Play” user experience to the home area network (HAN). As such, ClimateTalk standards do not dictate what an application can do on the network. Instead, they define a set of rules for discovery and sending information as a broadcast to all devices or messages directed to specific devices.

ClimateTalk provides the foundation for making connectivity and interoperability possible. To make any open standard work, manufacturers must conform to a basic set of rules for forming a network and establishing a common command set recognized by all devices on that network. Whether the command is for control, enabling user menus, or is a response to external inputs such as a peak load shed command, the ClimateTalk standard defines a series of messages capable of being wrapped in different package formats and sent via a choice of transport protocols.

Utilities are well versed in the production of energy, but less experienced in how to make appliances operate most efficiently. Home appliance manufacturers know how to design and build their products, but are less experienced in the new requirements for Smart Grid connectivity. Additionally, most consumers are unlikely to accept any technology that requires them to sacrifice performance or comfort. The ClimateTalk Open Standards provide a bridge between these two areas of expertise by minimizing the requirements for connecting ClimateTalk-enabled devices to the Smart Grid and by systematically providing the clean execution of Smart Grid commands over a potentially automated network of appliances.

Member companies of the ClimateTalk Alliance have the technology and expertise to help manage peak loads while adding tremendous value to the consumers. They now have the ability to provide new and innovative approaches to holistic energy management in addition to the control, diagnostics, and data exchanges that are a critical component of automated systems.



ClimateTalk Is Relevant

With over half the energy in the home consumed by HVAC and water heaters alone, connecting these systems to the Smart Grid provides the single largest positive impact during peak load conditions. However, neither the utilities nor the third party providers have the experience or expertise that the HVAC channel has for supporting and connecting these HVAC systems or water heaters to the Smart Grid.

Without a common standard, generic thermostats will not interoperate with the new generation of advanced communicating HVAC systems. For a utility to engage a homeowner with a communicating HVAC system in a Demand Response program, the utility or third party service provider currently needs to know how to interface and communicate with each brand of thermostat and system. A more likely scenario is that they will just skip that house and move on to the next one.

In addition to the inventory and labor implications this causes, the added complexity is counterintuitive to driving the widespread adoption of more efficient and more capable equipment. As such, having the backing of the major OEMs in this market, as well as the channel supporting the sales and installation of these products, is crucial to the success of the Smart Grid.

The ClimateTalk Alliance consists of major players and thought leaders in the HVAC, zoning, and water heater markets. These ClimateTalk Alliance participants comprise a major force in the industry and either have ClimateTalk enabled products now, or are in the process of designing and developing them already.

In addition, the ClimateTalk Alliance members have well-established channels for moving products once they are developed. As inventory moves through the system, it builds value at each step of the supply chain. The distributors become the local experts and invest in inventory so it is on hand and immediately available. The contractors themselves are not only the in-home sales agents; they are the installers ensuring that the network is operating correctly, reliably, and efficiently.

ClimateTalk Open Standards reflect the needs of this network of distributors and dealers that support the technical and logistical requirements unique to the HVAC market. By providing Plug-N-Play connections, ClimateTalk Open Standards eliminate the need for the complex commissioning, addressing, or programming of devices in the field. Without complicated control wiring and tedious dipswitch settings, the installation is typically performed correctly the first time and the homeowner's equipment is operating as close to its rated efficiency as possible. This eliminates the need for residential contractors to invest in specialty training on network topologies and communication theories.

Summary

History has proven that, when market leaders join forces to support industry objectives, the rest of the industry will follow. For years, there have been teams of academics playing in the desert with electric vehicles. It was not until GM started development of its electronic automobile, the "Volt," that meaningful discussions about modern electric cars took place. Today, the electric vehicle market has grown enough that communities already are looking at which locations to place charging stations.

This is not a hypothetical initiative. Products designed to ClimateTalk Open Standards are available today. These standards have been tested and found to provide the stability and reliable control critical systems like HVAC require. With their foundations in HVAC systems, the ClimateTalk Open Standards provide the horsepower to drive even the most complicated systems in the home. They also are scalable enough to support the requirements of the wide variety of ecosystems in the home including pool pumps, solar panels, white goods, and other types of loads that are heavy consumers of energy with a need for automation, connectivity and enhanced user interfaces. Synergies exist between the business models for monitoring home security and those for monitoring HVAC equipment, which are being explored by a variety of industries for their potential in advancing the connected home.

The return on investment for Smart Grid technologies, as it relates to Demand Response services, relies on the ability to reduce loads during peak usage times, allowing utilities to rely less on expensive standby generation. The HVAC and water heater systems are critical pieces in this important puzzle. ClimateTalk is the universal language providing innovative and cost-effective solutions that optimize performance, efficiency, and home comfort. In addition, this single unified standard supports the objectives of both the Smart Grid and the utilities while opening the doors of innovation that will ultimately enable that dream of the fully connected and energy-efficient home of the future.

What is the ClimateTalk Alliance?

The ClimateTalk Alliance is a non-profit organization whose purpose is to take ClimateTalk to the next level. Its mission is to build vendor-neutral solutions around an open HVAC model designed for OEM differentiation, to set the direction for the future of ClimateTalk, and to drive certification by an international standards board.

The alliance has three membership levels:

- Promoter
- Contributor
- Adopter

Each level includes promotion of your solutions, visibility to the industry, access to approved specifications and requirements documents, and use of the ClimateTalk brand. Depending upon your company's membership level, membership provides the opportunity to participate on the Board of Directors and in the Working Groups developing and approving the specifications and standards.

Become a Member

Are you interested in the possibilities ClimateTalk provides for your company? If so, we invite you to be-come a member of the ClimateTalk Alliance. For more information, visit our website at www.ClimateTalk.org or email Help@ClimateTalk.org.

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