September, 2014

WORKING GROUP 10B

CPE Powering – Best Practices

Final Report – CPE Powering

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1 Results in Brief

1.1 Executive Summary

Working Group 10 of the Communications, Security, Reliability, and Interoperability Council (CSRIC) is focused on addressing Customer Premise Equipment (CPE) Powering.

"With the rapid proliferation of VoIP technologies as substitutes for legacy telecommunications services, end-users are now utilizing a service that lacks the lifeline they were once accustomed to. Instead of being powered from the resilient backup power infrastructure in the serving central office, the user's home device is powered by a local battery when line power is lost, as often happens during emergencies. Different communications providers have different policies as it relates to powering these devices. This Working Group will recommend best practices for providing backup power to VoIP customer premises equipment, including best practices for consumer notification."

CSRIC Working Group 10 structured itself into two sub-groups to address CPE powering best practices and consumer notification. This report reviews best practices for nine use cases of VoIP service configurations commonly deployed in the United States. The appendix contains a compilation of all the best practices recommended by Working Group 10.

2 Introduction

The CSRIC was established as a Federal Advisory Committee designed to provide recommendations to the Federal Communications Commission (FCC) regarding best practices and actions the Commission can take to ensure optimal security, reliability, and interoperability of communications systems, including telecommunications, media and public safety communications systems. CSRIC created ten working groups, each with its own area of responsibility. Working Group 10 was charged with examining CPE powering best practices and consumer notification.

Working Group 10 identified nine use cases that encompass VoIP deployments in the United States today. These use cases range from those that are typically deployed with battery backup today to those that are never or rarely deployed with battery backup. Increasingly, battery backup is being offered as an optional accessory to the consumer, which they can control and manage themselves. Use cases that currently have no battery backup options will be challenged to offer battery backup as an option to consumers, but working with their vendors we believe every use case is capable of supporting a higher reliability than today with battery backup.

In addition to examining the best practices for the nine use cases, this report also looks at battery technology options being utilized in the industry today. Due to the confluence of battery technology and a wide variety of DC power options, some level of standardization is needed of DC power systems and interfaces, if VoIP services are to meet the reliability that consumers expect in the United States.

2.1 CSRIC Structure

Communications Security, Reliability, and Interoperability Council (CSRIC) IV									
CSRIC Steering Committee									
Chair or Co-Chairs: Working Group 1	Chair or Co-Chairs: Working Group 2	Chair or Co-Chairs: Working Group 3	Chair or Co-Chairs: Working Group 4	Chair or Co-Chairs: Working Group 5	Chair or Co-Chairs: Working Group 6	Chair or Co-Chairs: Working Group 7	Chair or Co-Chairs: Working Group 8	Chair or Co-Chairs: Working Group 9	Chair or Co-Chairs: Working Group 10
Working Group 1: Next Generation 911	Working Group 2: Wireless Emergency Alerts	Working Group 3: EAS	Working Group 4: Cybersecurity Best Practices Working	Working Group 5: Server-Based DDoS Attacks	Working Group 6: Long-Term Core Internet Protocol Improvements	Working Group 7: Legacy Best Practice Updates	Working Group 8: Submarine Cable Landing Sites	Working Group 9: Infrastructure Sharing During Emergencies	Working Group 10: CPE Powering

Table 1 - Working Group Structure

2.2 Working Group 10 Team Members

Working Group 10 consists of the members listed below.

Name	Company
Lois Burns	State of Pennsylvania
John Healy	FCC Representative
Marte Kinder	Time Warner Cable
Brian Allen	Time Warner Cable
Tim Walden	CenturyLink
David Russell	Calix
Eric Dreas	Comcast
Haifeng Bi	AT&T
Mark Adams	Cox
Mike Nawrocki	Verizon
Thomas Schwengler	CenturyLink
Barry Umansky	Ball State University
Steve Pociask	American Consumer Institute

Table 2 - List of Working Group Members

3 Objective, Scope, and Methodology

3.1 Objective

Working Group 10's objective is to compile a set of best practices related to the powering of consumer's CPE devices for VoIP services. Because VoIP services are deployed in a variety of configurations the Working Group identified nine different use cases commonly used in the United States today. Most best practices are common across all use cases, but some use cases have more specific best practices.

3.2 Scope

3.2.1 Problem Statement

With the transition of legacy telecommunications services to VoIP technology there have been a variety of consumer deployment models implemented by service providers. This transition has been accompanied by a shift from network power to local power of the network access device placed by service providers at the customer premises.

This has placed increased importance on the best approaches to provide backup power for consumers during outages and how best to inform consumers regarding the differences with legacy telephone service. For the service provider, one of the greatest challenges is how to provide a reliable service given the wide range of technologies and the lack of any standards for DC power backup systems and interfaces. As an analogy, imagine trying to service the needs of all consumers in United States for AC powered devices if there was no standardized AC wall plug. It would lead to chaos.

Even if a VoIP service has a good battery up system, the ability to provide power during outages is usually limited to a few hours. Best practices are needed to offer solutions that can last multiple days or even weeks, in case catastrophic damage, such as a major storm.

3.2.2 Working Group Description

Working Group 10 was tasked with defining best practices for the different types of VoIP deployments, each identified as a use case. Each use case is described and key differences in terms of the best practices are highlighted.

3.2.3 Deliverables

Each use case is described and an approach for providing battery backup is outlined,
Best practices associated with the nine different VoIP deployment models are documented.

3.3 Methodology

3.3.1 Methodology Overview

Working Group 10 was made up primarily of service providers and other key industry stakeholders. The team met bi-weekly, but between meetings consulted with subject matter experts within the service providers and the vendor community.

3.3.2 Sub-Team Organization

Working Group 10 had two sub teams. The first sub-team focused on education and outreach. The second sub-team focused on defining the use cases commonly used in the United States today and best practices for and best practice aimed at ensuring reliable service during power outages.

3.3.3 Sub-Team Approach

The Best Practices Sub-Team Group began meeting in January, 2014 to discuss the scope of the sub-Team and to determine the subjects to be addressed. The Sub-Team performed an analysis of the methods and procedures commonly being offered by VoIP service providers in the United States today The team identified several deployment models that had gaps that could impact the reliability during electrical outages and recommended best practices to address these circumstances.

4 Background

The deployment of a VoIP service requires that analog voice signals are converted to IP utilizing a voice codec. These codecs support a variety of standards developed to support voice, fax and other legacy TDM services over IP. The codec function is referred to as the Analog Telephone Adapter (ATA) in this document.

The ATA function is typically deployed in devices owned by the network operator, however, in several of the use cases the ATA function is being placed in consumer owned devices. This creates more challenges for battery backup of the VoIP service.

One clear trend across all VoIP use cases is that battery backup is increasingly being offered as an option to the consumer, with the cost and maintenance of the UPS and batteries being the consumer’s responsibility. As a result, the Working Group approached each use case from the perspective of what was needed to provide battery backup and the challenges associated with that use case. This was particularly a challenge in those use cases that currently do not have a battery backup option.

A second trend was the desire for longer periods of battery backup. Due to recent catastrophic weather events and fears of future major power disruptions, the need for approaches that provide more flexibility and approaches that can last longer than a few hours of battery backup was a major focus of the sub-team.

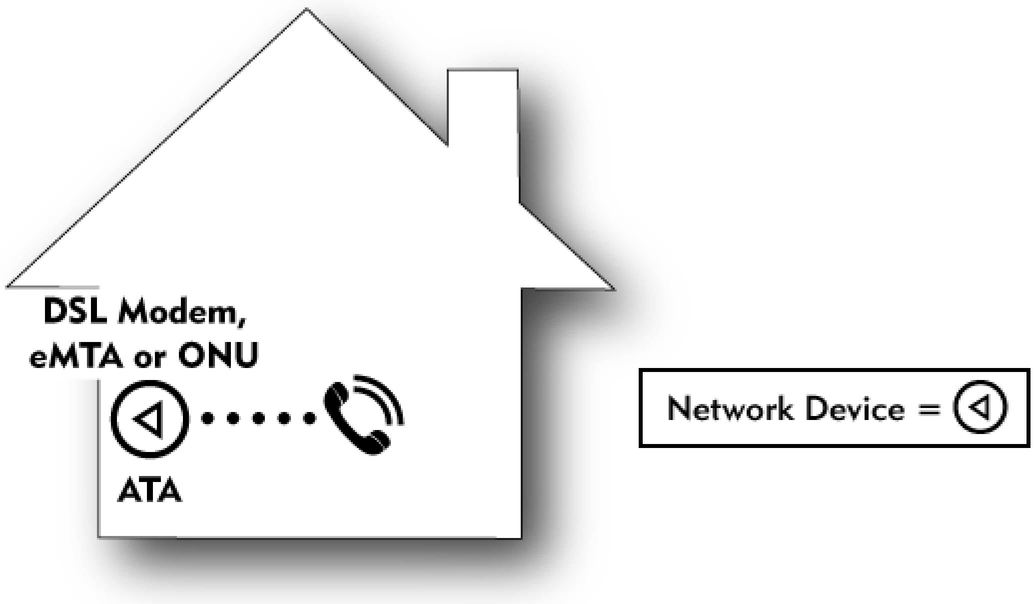
There are three types of battery technology commonly used with ATAs. They vary in their ability to address longer power outages, cost and ease of maintaining or replacing them.

1. Lead Acid Batteries-These are the most common form of batteries used in communications systems, including UPS devices deployed in consumers' homes. Lead acid provides the highest performance at the lowest cost of any of the technologies. The batteries tend to be large and somewhat bulky. They are available through battery retailers, some mass market retailers or through service providers. Lead acid batteries can be recharged and last many years.
2. D Cell Alkaline Batteries-These are the most widely available batteries. Because they are sold my most retailers, D-cells are easy for consumers to purchase and maintain. As a primary battery type, these batteries are generally discharged once and then replaced. Products are coming to market that enable D Cells to support VoIP services over time periods comparable or longer than lead acid, and they must be replaced once discharged. During long catastrophic power outages D cells can easily be replaced with new batteries purchased at any retailer.
3. Lithium Batteries-Noted for their small size and high performance, Lithium batteries are increasingly being used in PCs and other consumer devices. They are higher cost than the other battery technologies, but are expected to decrease in cost over time. Lithium batteries can be recharged, but may show aging effects. The versions used for network applications are not available through retailers today, but must be purchased through service providers or from the vendor of the CPE device.

5 Description of Common Use Cases

Nine use cases were identified that encompassed the deployment of VoIP services to consumers' in the United States. After each use case is a recommended approach for battery backup. Best practices are described in the Appendix and the use cases that apply to them are identified.

Use Case 1 ATA Function in Network Device Inside the Home



Deployment Description

The most commonly deployed model for VoIP services in the United States is to locate the ATA function in a network device, installed inside the living unit. Commonly used in hybrid fiber coax cable networks that use embedded multimedia terminal adapters (eMTA), twisted pair telephone (DSL) networks and increasingly Fiber-to-the-Home (FTTH) Optical Network Units (ONUs), also called ONTs.

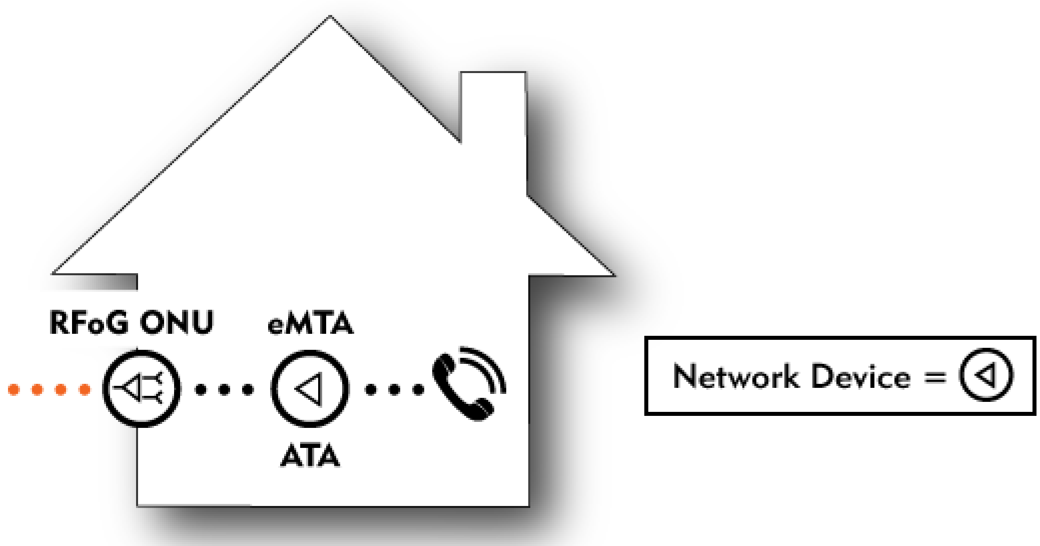
The network device provides at least one RJ-11 jack (phone line interface) to connect to traditional telephone handsets. Low voltage power is provided to the telephone handsets via the RJ-11 jack in the network device. Many ATAs can connect more than one phone line via additional jacks and also have other interfaces, such as RJ-45 Ethernet and USB ports.

Battery Backup

The network device, with the embedded ATA function, is powered directly by AC or through a UPS that converts AC to DC power. Network devices that are directly AC fed may have small battery packs that consumers can install in their devices. These may be Alkaline or Lithium technology. UPS powered units typically use lead acid batteries. These battery backup approaches achieve 4-8 hours of backup time for voice services. New approaches are coming to market that use "D" cell batteries in conjunction with a power adapter or power strip. These devices achieve significantly greater backup power times and have an on-off switch so that consumers can make batteries last even longer during extended power outages.

The Best Practices associated with this Use Case are identified by the number 1 in the Appendix.

Use Case 2 ATA in Network Device Inside the Home-RF-Over-Glass (RFoG)



Deployment Description

Radio Frequency over Glass (RFoG) is a fiber deep hybrid fiber coax (HFC) architecture used by cable operators, in which the coax portion of the network is replaced by a single fiber passive optical network (PON). RFoG provides the same set of services as traditional cable networks, but with improved noise performance and reliability. An RFoG micro node (R-ONU) terminates the fiber connection at the premise. The R-ONU does not terminate VoIP traffic, but passes this traffic to an eMTA device with an embedded ATA. Therefore, this use case is the same as Use Case #1, except that the R-ONU sits at the edge of the house and does optical to electrical conversion...

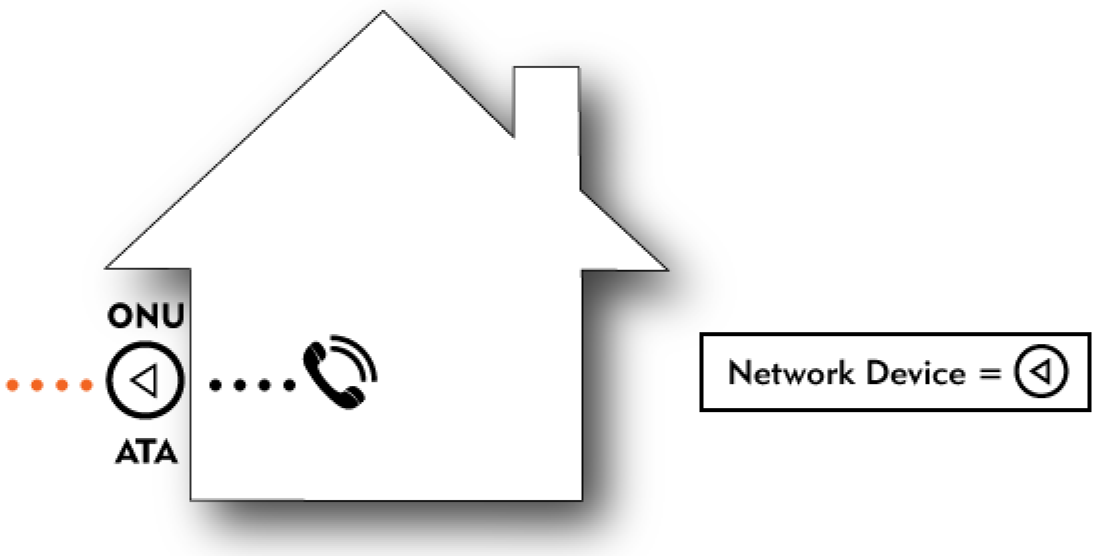
Battery Backup

Both the R-ONU and the eMTA must have battery backup for the VoIP service to remain available during power outages. R-ONU deployments often utilize a UPS with a lead acid battery. This UPS may be the same UPS that backs up the eMTA, or the eMTA may have its own embedded battery backup or UPS with battery backup. Current deployments of eMTAs support backup times of up to 8 hours of standby and 5 hours of talk time. Some R-ONUs and eMTAs support embedded internal batteries.

Subscribers must be made aware that both the R-ONU and standalone eMTA require power in order for the VoIP service to operate. The subscriber must also be aware that during an AC power outage backup power is provided by either UPS battery or by internal batteries in the R-ONU and eMTA. Subscribers will need to check and maintain batteries in both devices to ensure continuing VoIP service during commercial AC power outages.

The Best Practices associated with this Use Case are identified by the number 2 in the Appendix.

Use Case 3 ATA Function in Network Device Outside the Home



Deployment Description

This use case is typically represented by a Fiber-to-the-Home (FTTH) system that incorporates an outdoor-mounted device known as an optical network unit or terminal (ONU/ONT). These deployments use a UPS or a wall transformer, but the outdoor deployment model typically uses the UPS. Having the network device mounted outdoors makes it easy connect to the various service cables entering the home.

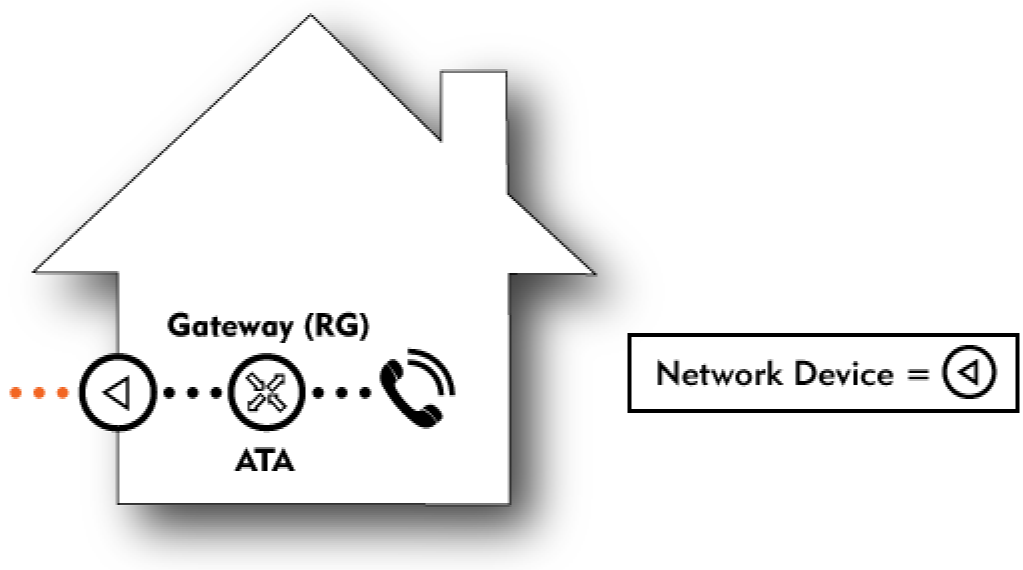
Battery Backup

In most installations, a UPS containing lead acid batteries is mounted inside the home or garage to provide battery backup in the event of a commercial power outage. These UPS devices with battery backup are also available in outdoor rated devices. Although the ONT may support multiple services, the backup capability is usually associated only with voice services or as a provisioned option with Ethernet based services. The length of backup time varies, but a common goal for the customer is to obtain 8 hours of standby battery backup.

This use case provides similar opportunities for new approaches for backup battery design (such as "D" cell batteries) as described in Use Case 1.

The Best Practices associated with this Use Case are identified by the number 3 in the Appendix.

Use Case 4 ATA Function in Residential Gateway



Deployment Description

In this use case, the VoIP ATA function is embedded in a residential gateway (or RG) separate from the network access device. The network can be hybrid fiber coax, twisted pair, or FTTH. The network device may be located indoor or outdoor. The residential gateway (or RG) may also include a router, Wi-Fi and other functions, NAT, firewall, etc... A standard analog phone is connected to the RG via RJ-11. This deployment model is rare in the United States, since RGs do not typically have battery backup, so service providers usually prefer that the ATA function be placed in the network device. But a variety of RG vendors do include ATA functionality in their devices, so this use case could increase in the future.

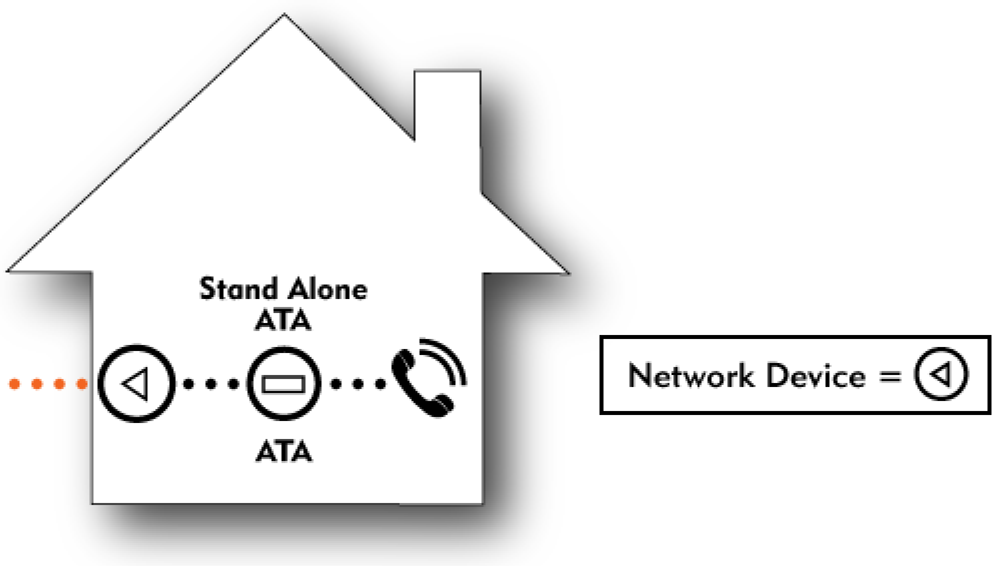
Battery Backup

In this use case, both the RG and the network device require battery backup, in order for the VoIP service to continue to operate during a power outage. Consumers should be made aware that the battery backup for the RG and the network device should not be used in an interchangeable manner nor should their batteries. If both the RG and the network device are not provided by the same service provider, the VoIP service provider should assume responsibility for providing the customer with clear information that without both devices being battery backed up, the VoIP service will not continue during a power outage.

If properly sized, it is also possible for both devices to utilize the same UPS with battery backup. One approach would be to back up the RG with the ATA function, and then utilize Power-over-Ethernet (POE) to power the network device off the RG. An alternative is to power the RG with POE, using the network device with battery backup, as the power source.

The Best Practices associated with this Use Case are identified by the number 4 in the Appendix.

Use Case 5 Standalone ATA Device



Deployment Description

In this use case, the ATA function is provided in a separate standalone device.

These are most often used by VoIP application providers that provide a standalone ATA unit which connects to the network device via Ethernet. These standalone ATA devices are typically small boxes with Internet connectivity and one or more analog phone lines (RJ-11). Some also include speaker phones and higher value features.

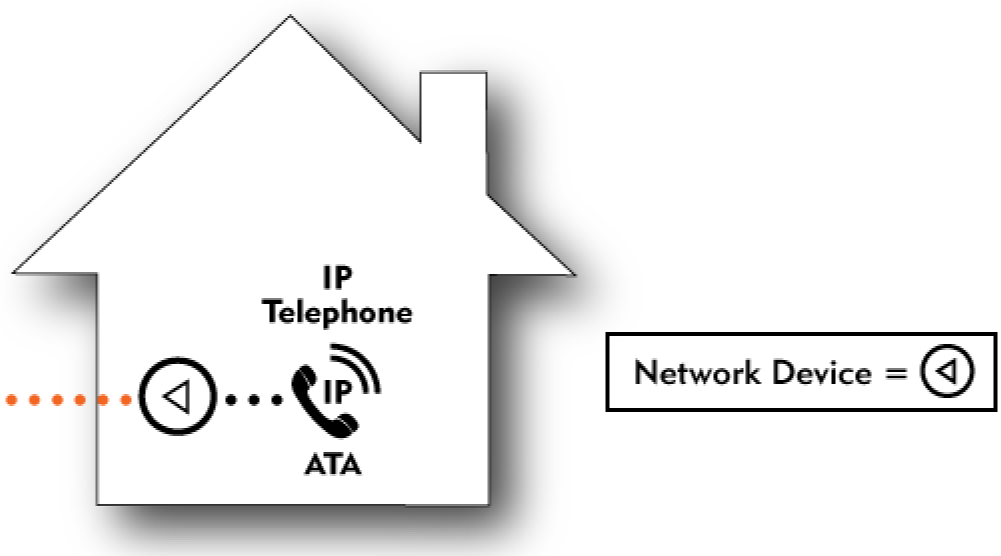
These devices are available from major electronics retailers or VoIP application providers. Today, these devices rarely have battery backup.

Battery Backup

It is important that VoIP service providers educate consumers about the implications of not having battery backup during a power outage, going forward battery backup solutions are an option for these VoIP services and service providers can educate the consumer on backup solutions about this option. Because these ATA devices are owned by and managed by the consumer, the "D" cell battery backup approach may make the most sense since the consumer then can easily purchase and maintain the battery backup unit.

The Best Practices associated with this Use Case are identified by the number 5 in the Appendix.

Use Case 6 ATA in Telephone



Deployment Description

With the widespread adoption of VoIP services there is an expanding use of telephone handsets that have the ATA function embedded directly in the handset. These are primarily used in commercial settings, such as enterprises and hotels, in conjunction with VoIP PBX systems. But these systems are also being used in communal residential settings, such as master planned communities, continuous care communities with independent living units, "man camps" operated by mining and oil companies, and resort communities.

Instead of the traditional analog phone connected to a network powered POTS line, the VoIP handset has embedded ATA functionality which connects via Ethernet to the network. The phone itself is stationary, as opposed to a mobile device. Power to the phone is provided either through an AC transformer that powers the phone or via Power-over-Ethernet (POE) where power is delivered via the Ethernet cable itself.

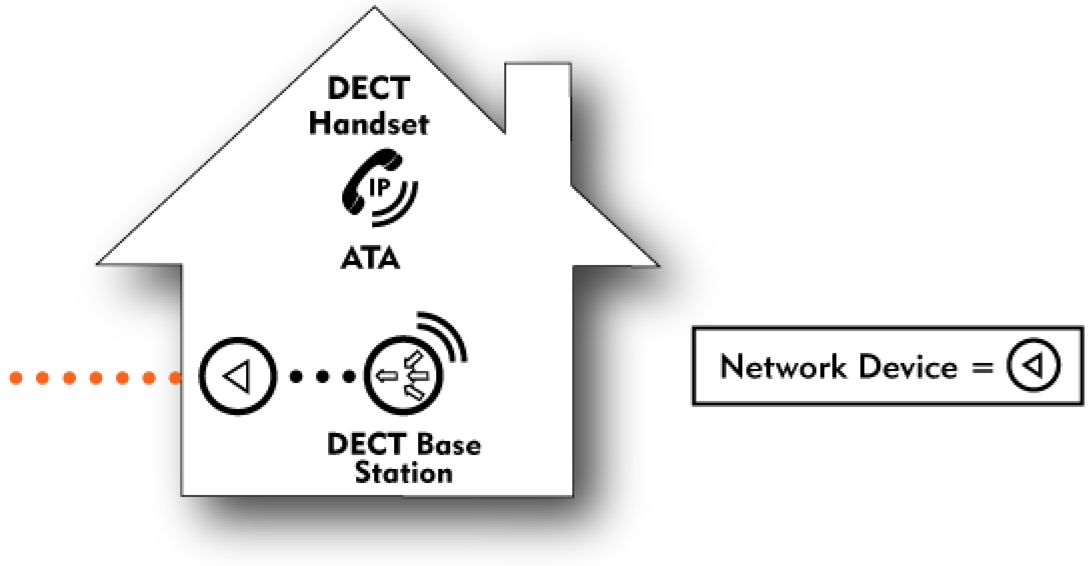
Battery Backup

VoIP phones that use simple AC-DC transformers do not have battery backup during commercial power failures. One solution is to power the phone using Power-Over-Ethernet (POE). Power is then provided via the Ethernet cable from the network device, which would utilize a UPS with battery backup. The network device could be an FTTH ONU, DSL modem or cable modem. Most of these units deployed today do not have POE capability, but a POE device could be provided when the consumer chooses to have battery back-up. Consumers will need to be educated by the VoIP service provider about POE and the option to maintain the battery backup to the source network device. Providing POE will reduce the battery backup time available to the network device due to the higher load.

One key requirement for battery backup in this use case is that the Ethernet port, on the network device, must be provisioned by the service provider to stay in service during power outages.

The Best Practices associated with this Use Case are identified by the number 6 in the Appendix.

Use Case 7 ATA in DECT Handset



Deployment Description

DECT is a global standard-Digital Enhanced Cordless Telecommunications. DECT is the basis for most retail cordless telephones sold in the United States.

Since their introduction DECT cordless phones have connected to the network via a standard analog POTS interface in the DECT base station. These base stations are powered by an AC-DC transformer with no battery backup. Even though DECT cordless phones have small, batteries for in-home mobility, during power outages consumers are not able to make calls from DECT cordless phones, since the base station is powered by AC.

DECT phones are now becoming available where the base station connects to the network over Ethernet. VoIP service can then be offered through an ATA embedded in the DECT handset. In the future, DECT base station technology may be integrated in other devices, including set top boxes or into network devices, such as cable or DSL modems, which may have battery backup capabilities.

Battery Backup

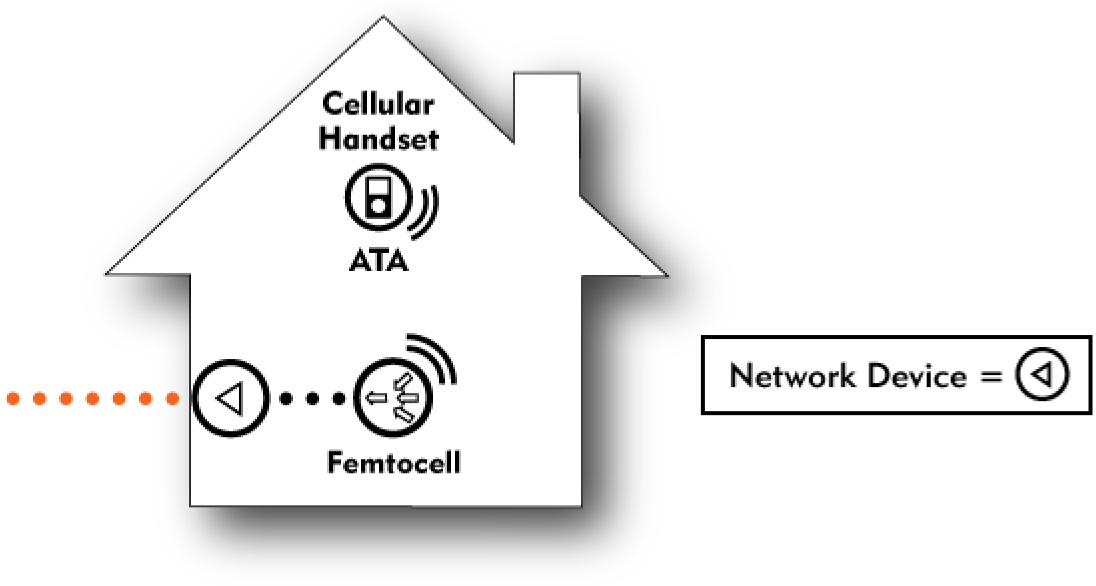
DECT phones in use today use AC-to-DC transformers and have no mechanism for battery backup capability during power outages.

Future network devices may integrate DECT base stations and enable battery backup of the DECT base station during commercial power outages. Alternatively, DECT base stations could be designed with battery backup units. If the base station was backed up, the batteries in the DECT handsets could be used to provide service during power outages. Most DECT handsets today use "AA" Alkaline batteries that are readily available from retailers.

When service providers provide an embedded or standalone DECT base station, with battery backup, they will need to educate consumers that the backup includes the base station and that their cordless phones will be usable during the power outage.

The Best Practices associated with this Use Case are identified by the number 7 in the Appendix.

Use Case 8 Cellular Handset via Femtocell Base Station



Deployment Description

This use case uses a regular cellular phone in a home with poor cellular network coverage. Cellular voice is transmitted as IP over the homes broadband access network connection via a Femtocell. This use case is expected to increase dramatically as consumers shift to using mobile phones as their primary phone at home. The Femtocell base station connects to the network device via Ethernet. Today the Femtocell is typically not backed up with batteries. Mobile phones can connect to the outside cellular network during power failure, assuming sufficient outdoor coverage.

Battery Backup

In this use case, both the Femtocell and the network device require battery backup in order for the cellular phone service to continue to work in the home during a power outage. If the Femtocell and the network device are not provided by the same service provider, the Femtocell service provider can provide the customer with clear information that without both devices being battery backed up, the service will not continue during a power outage. Service providers offering Femtocells will need to work with their Femtocell vendors can make battery backup available as an option to consumers.

The Best Practices associated with this Use Case are identified by the number 8 in the Appendix.

Use Case 9 – Wireless Home Phone Devices

Deployment Description

This use case covers a range of wireless home phone devices containing a cellular radio, an ATA function, an antenna, RJ-11 POTS interface and integrated battery backup. The device is mounted conveniently in the home and relies on standard AC powering. These devices have become more prevalent in markets with good wireless coverage and in cases where the consumer is discontinuing their landline phone service. Consumers can then utilize standard cordless phones or standard POTS-type telephone devices in the home.

Battery Backup

Consumers who choose this service can be educated that the wireless access device will need proper battery maintenance to assure operation during commercial power outages. This is especially important because consumers using POTS-type telephone devices, in connection with this configuration in the home, may not be aware that their service is not powered by the service provider. Battery backup options for these fixed wireless units utilize either lead acid or commonly available retail batteries for backup operation.

Consumers should maintain a traditional POTS-type telephone device in the home to use in conjunction with the backup operation of the wireless network access device during a power outage.

6 Conclusions

The transition from traditional telephone service to VoIP presents challenges for maintaining the quality and reliability that some consumers may expect from their home voice service. Some consumers value the ability to maintain voice communications during power outages., The ability to communicate during outages due to catastrophic storms or other unpredictable events is not just about the consumers' interest. Public safety officers, first responders and other public officials have a need to communicate with citizens through whatever means possible and emergency telephone can play an important role in this communication.

While battery backup is not commonly used in all of the use cases outlined in this document, we determined there is a path to battery backup in each case. Service providers will need to be proactive in engaging with their equipment providers to ensure viable backup options are brought to market. This is particularly true for use cases that today do not generally offer a battery backup option. Feedback from consumers, however, illustrates that the need for back-up power is evolving, as consumers increasingly rely on their cell phones and other portable devices for emergency communications during a commercial power outage.

We identified three areas where we recommend a more proactive approach by the FCC and industry to better address the challenges for reliable service across the various VoIP use cases:

1. The choice of the type of battery and the technology available for managing and monitoring battery capacity offers the opportunity to greatly extend the reliability of the service during long power outages. "D" cell batteries are an example of how longer outages can be addressed through existing supply chains, at little cost to the consumer. Improvements in battery technology are also allowing "D" cells to approach the backup times of lead acid batteries on single charge discharges. The beauty of "D" cells is that they are easy for consumers to replace and are readily available in mass quantities through retailers.

2. Power-over-Ethernet and other technologies offer the ability to power devices that might not be backed up today. POE is an established standard commonly used in hotels and other commercial applications. It could provide an easy to implement approach for backing up consumer ATAs that are connected to network devices with battery backup. Another example, deployed in a limited number of applications, solar powered network devices that rely on a renewable energy source, not dependent on the electrical grid. We encourage the FCC to further study the ability of these technologies to make a more sustainable power supply for CPE devices, such as VoIP ATAs.

3. The lack of any commonality or standards in DC power supplies negatively impacts the ability to back up VoIP systems. Every vendor of a DC powered CPE devices makes their own decisions on power adapters and interface connectors. As an example familiar to all consumers: Every time a consumer buys a new cordless or mobile phone, it comes with a different adapter and a different connector, even when they are from the same vendor. If the DC supply and interface connectors could be standardized, such as we have for AC, it would enhance vendors' ability to design better battery backup systems that can be used across different use cases and different vendors' equipment. Without these standards, the variety of approaches to premises powering is likely to get worse with the proliferation of different technologies and VoIP use cases.

7 Appendix: Best Practices

New Best Practice Number	**Use Cases**	**Description**
New 01	1,2,3,4, 5,6,7,8, 9	Service providers should provide consumers an affordable option for battery backup of the CPE device that contains the ATA function. Service providers need to inform consumers of the implications for their voice service during power interruptions, if they choose not to have battery backup.
New 02	1,2,3,4, 5,6,7,8, 9	Service providers should educate consumers of the need to be informed about the specific impact on their chosen VoIP use case, if not backed up with batteries during a power outage.
New 03	1,3	Service providers should embed the ATA function in network devices that are easily backed up with batteries. Use cases that require multiple devices to be backed up with batteries should be discouraged by service providers as less reliable.
New 04	2,4,5,6, 7,8,9	Service providers should work with their network device and CPE vendors to develop approaches for battery backup for use cases where little or no backup is offered today.
New 05	4,5,6,7, 8,9	Service providers should work with their network device vendors to develop alternative powering technologies, such as Power-Over-Ethernet, so that network devices can act as sources to power cordless base stations and phones with embedded ATAs.
New 06	1,2,3,4, 5,6,7,8, 9	Service providers should work with their vendors to provide consumers a mechanism for extending the time period of available battery power by including an on/off switch on the battery unit for use by consumers. This allows battery power to be saved for when calls need to be made

New 07	1,2,3,4, 5,6,7, 8,9	Local public safety officials should create disaster response plans that include plans for backup battery supplies in the same way they have a plans for food, water, and fuel during power outages.
New 08	1,2,3,4, 5,6,7,8, 9	Service providers should work with their vendors to standardize on DC power supplies and connector interfaces for network devices and CPE so that a common battery backup unit can be used in the home, with multiple devices.
New 09	1,2,3,4	Battery backup power is a finite resource, CPE equipment should by default turnoff all communication services, except voice when on battery. Voice line will be in standby mode. The difference between talk time and standby time as it relates to the depletion of backup battery is significant. Talk time (using the phone) will deplete the battery faster than when the phone is in standby mode (not being used).
New 10	4,5,6,7, 8	In those cases where VoIP service utilizes an Ethernet port on the network device, the Service Provider should ensure that the Ethernet port is powered during the commercial power outage.
New 11	1,2,3,4, 5,6,7,8, 9	Service providers should have mechanisms in place to ensure adequate network capacity for emergency calls during commercial power outages.
New 12	1,2,3,4, 5,6,7,8, 9	Service providers should offer consumers who choose battery backup spare batteries, at reasonable cost, for use during times of extended duration power outages or to replace batteries.
New 13	1,2,3,4, 5,6,7,8, 9	To prolong battery and device reliability, the network or CPE device with the ATA function should be placed in a location that provides adequate ventilation (e.g. ensuring proper airflow exists around the device and vents are not blocked or restricted). Also ensure the ATA device is not placed in an unusually hot, cold or damp location.
New 14	1,2,3,4, 5,6,7,8, 9	Service providers should work with their vendors to provide a mechanism to monitor battery status and determine whether the battery is degraded. This can be through remote monitoring of batteries as part of the service offered to consumers or through LEDS visible to consumers.
New 15	1,2,3, 4,5, 6,7,8,9	The UPS or network device with ATA and embedded batteries can have LEDs for visual battery status monitoring. The LEDs for status of embedded batteries should include battery missing, battery charging, replace battery, and battery full.
New 16	1,2,3,4, 5,6,7,8, 9	Indoor network devices must be grounded in compliance with applicable National Electric code standards and other applicable state and local ordinances
New 17	3	Network devices with an embedded ATA function mounted outside must be properly grounded. A typical outdoor installation will include a ground plate on the enclosure that must be directly bonded to the building's AC utilities earth ground electrode using a #6 AWG copper conductor (stranded or solid).Service providers should follow Article 250 of the NEC for appropriate grounding procedures.
New 18	1,2,3,4,	Service providers, as part of consumer education efforts,

	5,6,7,8, 9	should provide a full explanation of emergency use capabilities, battery backup units and how to access detailed information about battery backup as part of the service providers' explanation of the service at the customer premise.
New 19	1,2,3,5, 6,7, 8,9	Service providers should proactively notify consumers prior to an anticipated extreme weather event. The service provider should include detailed information about emergency use capabilities, battery backup units, or how to access detailed information about battery backup units. This consumer outreach can be achieved through specifically designated storm preparation information, through routinely listed information on the provider's website, or other means to ensure reaching all consumers.
New 20	1,2,3,5, 6,7,9	If service providers rely on any hardware to be placed at customer premise by the customer, they should provide a full explanation of operations during power outage, including detailed information about battery backup units, in their installation manual and on their website.
New 21	1,2,3	Service providers that offer remote battery monitoring through status reporting telemetry should offer a battery replacement service for an additional fee to the consumer.
New 22	2,4,5,6, 7,8	Service providers should educate consumers that DC power supplies and batteries for network devices and other customer premises equipment are not interchangeable.
New 23	1,2,3,4, 5,6,7,8, 9	Service providers with no battery monitoring capability should offer a voluntary program to notify consumers, who choose to be reminded, to check battery status based on the installation date, or the battery's manufacturing date, and the theoretical average life expectancy of the battery.
New 24	1,2,3,4, 5,6,7,8, 9	Service providers should provide information about where consumers can purchase replacement batteries, model numbers, and price on their website.
New 25	1,2,3,4, 5,6,7,8, 9	Service providers should provide clear instructions to consumers as to the proper disposal/recycling options for their used batteries. The battery purchase or replacement process in the service provider agreement must instruct the subscriber on proper battery recycling or disposal. Batteries for recycling are accepted at no charge at various locations identified at www.call2recycle.org or 800-8BATTERY. It should be noted that that many localities and states have regulations regarding battery recycling.
New 26	1,2,4,5, 6,7,8	Service providers should offer consumers a battery recycling kit part of the battery backup service. The recycling kit is then sent to the customer along with the replacement battery. Upon receipt, the customer is to install the replacement battery, put the used battery in the recycling bag, affix the pre-paid shipping label to the bag, and ship the used battery to a pre-designated recycling center.
New 27	1,2,3,4, 5,6,7,8, 9	Service providers should offer, as an option to consumers, the additional purchase of whole home power protection device placed at the main electrical panel to prevent damage

		to CPE devices, including the device with the ATA function during extreme weather conditions
New 28	8	Service providers should ensure that users understand that both the network device and the Femtocell base station must work together to provide connectivity to the cellular phone. Assuming the in-home cellular coverage is poor, in order for a cellular phone to continue to work during a power outage through a Femtocell, both the network device and the Femtocell base station need to have battery backup.
New 29	1,2,3,4,5,6,7,8,9	Service providers should offer detailed instructions along with step by step photos or drawings of the battery replacement procedure.