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INTEGRITY INTO EVERYTHING

# DISSECTING IOT FOR THE RURAL BROADBAND ECOSYSTEM

## Introduction

Currently comprised of more than 30 billion connected devices, the Internet of Things (IoT) is a massively transformational trend. While many consumers are familiar, and increasingly comfortable with, smart devices inside their homes, the broader applications and implications represented by IoT outside of the home is massive.

The business and industry uses of IoT are many and widespread, and broadband networks are the infrastructure that will enable the technology; as IoT continues to grow, physical networks will need to grow as well. This is especially true in rural areas, where IoT is reshaping and adding new value and efficiencies to many industries, such as Agriculture, Healthcare, Education, and Smart Towns.

Understanding the future growth potential for IoT and having the ability to engage in intelligent planning will be fundamental requirements for meeting this opportunity head on.

This whitepaper examines IoT and provides several use cases that are relevant to rural markets in order to make the case for leveraging broadband network operations to effectively address and meet the present and future needs of the growing IoT industry.

## IoT: The Internet of Things

Conceptually, the Internet of Things is an aggregate term used to describe a network of physical objects with embedded sensors, software or other technology used to collect data and potentially communicate autonomously with other devices.

The term “Internet of Things” was coined in 1999, but it can be argued that IoT came into existence with the invention of the first wired sensor in 1959. Since then, IoT has grown exponentially in scale and comprehensive usefulness—from single-purpose wired sensors to closed loop data systems for industrial IoT, which have been used for power plants and municipal operations, to an open web services-based IT system. Great strides have been made in coupling big data, machine learning and advanced analytics; then driving insight and making the analytics data actionable. That said, IoT is still limited by existing infrastructure.

According to Peter DeNagy, Co-founder, and Board Member for IoT America, “It has been projected that by 2025, there will be 50 billion connected devices, and we’re already well on our way to reaching that number—but from any meaningful and forward-looking perspective, there can be no IoT without fiber”.

From the fiber standpoint, infrastructure still varies widely and there’s definitely room to grow. To understand what some of the infrastructure needs might be, it might be helpful to look at several of the current use cases and how they relate to the rural broadband ecosystem.

## Four Significant IoT Use Cases for Rural America

IoT as it relates to residential services is already well known in the industry, for instance, a great many rural ISPs have already addressed Smart Home applications

such as home automation, home control, and home security. From business and industrial perspectives, segment opportunities can be much more expansive than the residential use cases might suggest.

### Agriculture

The impact of agriculture on rural communities is enormous, and IoT trends for agriculture are compelling, where the primary goals are to increase yields, decrease loss, and conserve resources. IoT provides enormous benefit in its ability to provide insight and actionable data in terms of soil monitoring, for moisture, PH, and nutrient levels. Access to this sort of data can be critical in maximizing crop yields and reducing loss. Additionally, the use of sensors for managing and locating farm equipment, tractors, and vehicles on a large agriculture installation can greatly reduce the amount of lost time that is incurred. Furthermore, sensors can also be used to conduct tank monitoring to transmit data about grain, fuel, and water levels, which are instrumental to the proper care, management, and maintenance of any agricultural enterprise. The basic ability to gain transparency into water and crop management for irrigation, runoff, soil, and pest control are all functions that IoT is well-equipped to handle.

### Healthcare

Now more than ever, finding ways to assist and care for patients in need is crucial. IoT-driven software can help manage occupancy and wait times within hospital units and emergency rooms to address the control and spread of infectious diseases, such as COVID-19. Remote health and monitoring means that in many circumstances remote evaluation can be delivered immediately, thus reducing the need to travel to doctors' offices from distant rural locations. Fewer people in the physical location reduces exposure to contagious diseases, and maximizes efficiency and cost savings for both the medical professional and the patient. IoT monitoring can also be used to ensure the availability and accessibility of critical hardware, which can be particularly meaningful in medical facilities that use costly and highly specialized equipment. The IoT advantage in tracking staff, patients, inventory, for providing enhanced drug management, and even addressing chronic disease issues through the use of wearable tech, such as Fitbit, is immeasurable.

### Smart Towns

Since the main focus of IoT is for gathering data for its ability to provide actionable information, it can have a game-changing impact on small cities and towns where it can be used to forecast potential disruptions in operating processes, financial impacts of maintenance and procurement, and managing cost and time overruns used in locating lost or missing equipment. Simply put, good data can save both time and money in everything from efficient waste management to land, park, building, lighting, and traffic management. There is almost no touchpoint in city planning and maintenance that is not affected, improved, and made more efficient by the proper use of IoT.

### Education

In today's COVID environment, broadband to the home is no longer a nice-to-have, it's a must-have especially when it comes to home learning. From interactive whiteboards to remote attendance systems, database access, and test monitoring, IoT is crucial to ensuring the education system runs efficiently and smoothly.

While only four such use cases are presented here to provide illustration of the breadth of current scope for IoT, many more segments, such as Public Health and Safety, Manufacturing, and Transportation, offer future growth potential that is just as great.

## The Need for Intelligent Network Planning

*"Planning is bringing the future into the present so that you can do something about it now"*

-Alan Lakein

Intelligent network planning requires looking ahead six to ten years and anticipating future requirements. In light of expected growth in IoT, intelligent network planning demands that questions are asked regarding the types of infrastructure connectivity that will be required, speculating about potential latency and redundancy requirements, the types of capacity that will be needed, and the security elements that will be necessary to provide adequate protection.


Foremost in the majority of network planning sessions, there is a focus on ensuring the ubiquity of residential broadband (especially in rural America). And while this is a very important consideration, greater questions about comprehensive infrastructure persist. For example, is the infrastructure discussion comprehensive with regards to other future use cases, and what impacts do future services and technologies have on today's infrastructure decisions? With the understanding that technology does not remain static, coming to an understanding about whether future investments will be incremental or forklift in nature is an important subject to explore. While fiber networks and fixed/mobile wireless networks can both play a significant infrastructure role, it is generally assumed that fiber networks will have a greater lifespan, perhaps 30 years or longer. And both types of networks require addressing some key issues when planning for IoT:

## Fiber Networks

### Location

What impact does the specific geographical location of the network have on the system at large? Are there specific factors at play, such as moisture and temperature that need to be accounted for?

### Architecture

Is the architecture flexible in nature and can it be expanded? If so, what will it take to expand it?

### Access

Is there flexible access to reach fiber assets in order to augment those networks or add components in a way that's cost effective?

### Technical

Considering system longevity, how can future technical standards be addressed today?

### Security

As with the technical considerations, security is an ever-evolving subject. How can physical assets from network down to the fiber level be protected, while also putting in place the necessary structures that are needed to protect the network at the intelligence/logical level?

## Fixed/Mobile Wireless Networks

### Location

These may be similar to geographical considerations as they relate to fiber, but they may also be different due to spectrum issues related to the geography and terrain of your wireless network.

### Spectrum access

Is your spectrum licensed or unlicensed? Do you have the ability to operate without interference from others?

### Vertical assets

What vertical assets exist? In rural America, that can be predicated on major carrier towers, but it can also include water towers, grain silos, and so on. Depending on requirements and spectrum considerations, these assets can ultimately affect the ways in which a network can be implemented and expanded.

### User density

Depending on the technology and vendor, the number of connections and devices in a given sector can have an impact, and it pays to be cognizant of these issues during planning.

### Backhaul networks

Since much of the data in IoT is destined to reside in the cloud, either local or distributed, connectivity needs to be in place—and this is true of both wireless and fiber networks.

## Financial Considerations Are Part Of Your Intelligent Network Planning

As you plan out your infrastructure to support IoT there are a number of financial considerations and impacts that need to be a part of your discussions relative to the current costs of infrastructure in relation to the future costs of expansion or adding on new technology solutions. For instance, there may be significant current or future funding opportunities that can be leveraged due to the inclusion of IoT applications in your infrastructure, or there may be new revenue-generating opportunities that arise from hosting or selling IoT services. And, of course, there are a number of secondary impacts, such as creating new cost efficiencies or savings that allow you to free up additional capital that can be redistributed into other ventures.

Industry-wide, it's known that building out the necessary fiber broadband infrastructure will require enormous investments. In 2017, a Deloitte study suggested that a $130-150 billion investment would be required. In 2018, a study from CostQuest put a $61 billion figure to building out exclusively unserved rural areas of the US. And the cost and demand for broadband infrastructure build continues to increase.

In order to approach the forecasted need for broadband, funding will be required. Fortunately, capital has recently become available through a variety of funding sources, such as the Rural Digital Opportunity Fund (RDOF) auction ($20.4 billion), the ReConnect Program ($1.15 billion (combined rounds 1 &2)), the Connect America Fund (CAF II) ($1.5 billion). Additional funding may be available through capital investment and other means, as well.

## Conclusion

The Internet of Things is having a transformational impact on many consumer and business segments. From the smart home, to the smart farm, to the smart town, IoT is reshaping everyday life and business. Broadband networks, wireline and wireless alike, are the connectivity fuel of IoT. Service providers should aim to ensure their network planning includes capturing as much IoT opportunity as possible, both today and in the future. Intelligent planning combined with judicious use of available funding sources, such as the RDOF auction and ReConnect program, as well as other state and federal sources, can provide a stable base for growing your infrastructure to meet these demands.

**For more information on this topic and other services, contact Finley Engineering at 800-225-9716 and ask for Andy Heins, or visit FinleyUSA.com.**

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