EION WIRELESS

White Paper

Connecting Communities: A Rugged Approach to Remote Communication

Introduction

There has always been a great divide between wealthy, developed nations and poor, underdeveloped ones. This divide spans from economic wealth to social conditions, and it has now reached the communications and information technologies. This is what is now known as the digital divide.

In today's economy, connecting remote communities through broadband communication is the heart of the digital revolution - and critical to global long-term health and prosperity. It is believed that bridging the digital divide, and providing communications technologies to remote communities in developing countries can improve the lives of more than 80% of their population.

At the same time, these remote communities have very stringent constraints which make it economically unattractive to connect them. Many government agencies and businesses are left wondering how they can participate and take advantage of the technological advancements which are helping economies in the developed world thrive. They are now aware that in order for any community to become productive and prosperous, it must first be connected to the rest of the world through these communications technologies.

The traditional approach of extending urban-centric communication infrastructures to remote applications is no longer adequate, as governments and social organizations increasingly focus on providing communications services. Instead, these communities need a remote-centric business-oriented approach.

Technologies such as the Internet, personal computers and wireless telephony allow individuals, businesses, schools and governments to communicate and interact with each other, regardless of geographic limitations.

This paper provides the solutions needed to effectively provide a remote-centric rugged communication solution, while helping business and government executives achieve the highest possible return on their information infrastructure investment.

The Business Perspective

Applications through information technology (IT) are the driving forces behind every global business operation or government remote community initiative. Today, it is cost prohibitive for businesses and governments to dispatch human resources to collect information in order to make business decisions.

For example, in the energy resources industry, the resource extraction takes place in a remote area or worksite for a defined period of time. However, the business decisions using the information gathered from these remote locations is done in a central office far from the energy resource location. In these situations, the information is required in real-time and becomes critical from the business perspective. The same concept applies for remote community sensor applications - from environment monitoring to security surveillance.

In addition, connecting remote communities through IT networks for social, educational, and information sharing purposes enables huge gains on economic growth and prosperity for the regions, specifically in developing and emerging markets.

There is a high demand for data sharing and integrated communications for making intelligent business decisions and intelligent information sharing. All is required in real-time. Simply stated, a global business or government agency cannot afford to ignore real-time IT communication for remote communities.

Business and government leaders are keenly aware of the cost and importance of the application and the services they support. Not all, however, are aware of the

A remote community application is an application—or set of application programs—that performs business tasks or knowledge sharing in real-time, eliminating the geographical distance or environmental barrier. time, eliminating the geographical distance or environmental barrier.

appropriate technologies needed to make cost-effective information access that will reflect a significant business and economic return. In fact, most remote community projects assume that urban-centric IT infrastructure can be easily extended to their application.

In many cases, urban-centric IT infrastructure is an over-kill for remote community applications. It is also an inadequate fit for the extreme environmental and operating conditions. Choosing the appropriate infrastructure makes a significant business impact on the outcome of the enterprise's and community projects.

The Community Perspective

Typically, people relate remote community application to rural community information access. However, the scope also extends to various enterprises providing business transactions to inaccessible communities, such as offshore energy exploration and surveillance services. In addition, areas of dense population where the terrestrial IT infrastructure is cost prohibitive are also treated as inaccessible remote communities.

Over the past few decades, geographically-challenged remote and rural communities focused on providing basic needs for the population, while proactively, and in many cases, reactively emphasizing the catastrophic health epidemics. Similarly, global energy resource industries focused on identifying and exploring these resources in various remote locations. These are the intuitive steps that are required by the governments and businesses to establish a social and business base-line. At the same time, technology has been advancing at a phenomenal pace. Where IT communication was once considered a luxury, it has become a necessity forming the fabric of day-to-day living.

> Remote communities include geographically challenged communities, energy sources of resource industries, and dense populations with limited technological infrastructure.

The obvious questions are:

- What is the potential influence of the IT technology advancement for remote communities?
- What are the barriers to overcome in order to take advantage of the IT technological advancement?

The business and social implications of the IT infrastructure go far beyond the basic communication between individuals, to providing real-time health care, e-commerce, tele-education and public safety surveillance. Real-time decision making, whether to save a life, prevent a potential environment catastrophe or execute a business transaction is of paramount importance where one part of the world can assist the other at ease through the advancement of technologies.

The Risks and Challenges

In order to have a better understanding of the remote-centric approach, we need to understand the risks and challenges of extending urban-centric solutions.

Network Layering

The network is divided into four prime layers and we will discuss the risks associated with each of the layers when the urban-centric solution is used; User Application, Last Mile LAN, Data Aggregation, and Backbone Bandwidth.

1. User Application Layer

The user application layer, is the layer where the end-user accesses the network through various applications such as basic Internet access, data transfer, tele-learning or telemedicine and e-commerce.

Risks and Challenges

In urban-centric solutions, vendors update applications frequently causing the memory size of each application to constantly increase. This requires more memory or processing power in the user's computers. Typically, in this type of environment, the computer upgrade or replacement cycle is 3-5 years. Alternatively, in rural-centric solutions the upgrade/replacement cycle is 8-10 years.

The challenge is how to update the application – mainly from a remote location - for features and content, while at the same time keeping memory requirements to a minimum. The rural-centric approach addresses the application delivery through portals, where the end-user application memory is minimized.

Network Layer	Urban Centric Solution Risks
User Application Layer	Application memory overload
Last Mile LAN Layer	Computer replacement cycle, extreme weather conditions, extreme operating environments

Network Layer	Urban Centric Solution Risks
Data Aggregation Layer	Telecenter bandwidth Cost - multiple access points Terrain landscape
Backbone Layer	Backbone Bandwidth Inter Satellite technologies

2. Last Mile LAN

The next layer down from the user application layer is the last mile LAN, where the local area networking infrastructure is in place. This consists of wireless antennas, access points and routers that are required to transfer data locally to a backbone access point.

Risks and Challenges

This layer consists of indoor and outdoor equipment that is subjected to extreme weather conditions. In some cases, it could be high or low temperature ranges, extreme humidity changes and severe dust. In addition, the operating conditions may vary due to the remote location of the application where power fluctuations will be frequent or vibrations may be high.

The challenge is to provide equipment that meets extreme weather conditions, and at the same time be cost effective compared to urban-centric deployment costs.

3. Data Aggregation Layer

This layer connects the local area network to the backbone and global Internet. This layer aggregates all the data from various VSAT (Very Small Aperture Terminal) equipment, routers and service switches.

Risks and Challenges

The equipment must be scalable enough to handle small bursts of data from a few subscribers to large volumes of data from a large number of users. These are again subject to extreme environmental and operating conditions.

These scalability requirements have an impact and limitation on bandwidth. In many cases, one needs to have multiple aggregation centers to meet the bandwidth demand, which can have significant cost over-run if it is not taken into account at the network design stage. One must consider both the capital and operational costs.

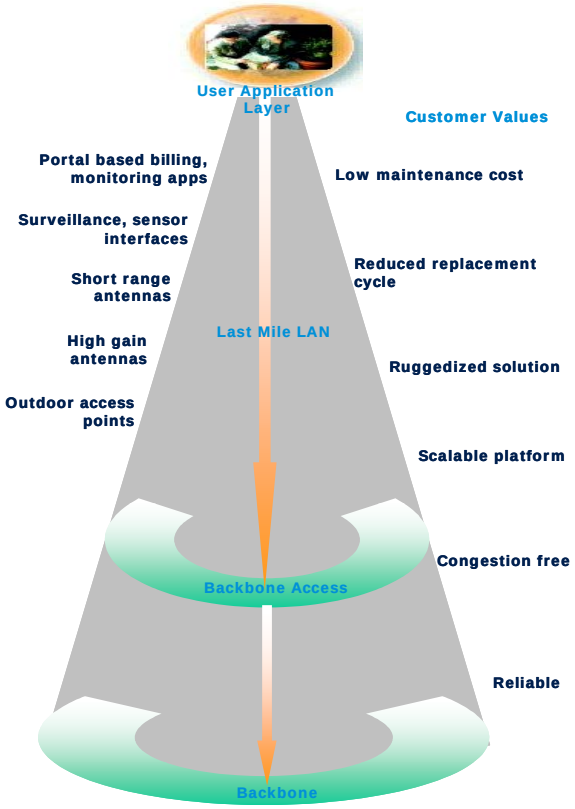
4. Backbone

This layer consists of the type of backbone, whether it is Satellite or Fiber. This layer has a lot to do with the service provider's coverage of the region. Typically, Satellite Service Providers offer the coverage and the bandwidth.

Risks and Challenges

It is imperative that the network takes into account the limitations of the backbone, as that determines the maximum throughput of the network and the applications supported.

This layer has the challenge of determining whether multiple hops are being traversed from Satellite to earth, before the data is transferred to the end-user. This has a direct impact on the application delay and is especially important for delay-sensitive Telemedicine, video surveillance or energy resources applications.



The Remote-Centric Communication Solution

The remote-centric solution does not compromise the end-user capabilities that an urban user enjoys. Rather, it focuses on the enabling technologies to meet application demands, bandwidth requirements, environmental constraints and maintenance or upgrade requirements, and making it cost-effective.

EION's Remote Community solution primarily focuses on Last mile LAN with advanced technological investments in

Satellite backbone technologies such as Inter-Satellite Links. This gives EION an edge on being focused in providing Last Mile LAN commercial solutions, and at the same time, understanding the strengths and limitations of Satellite based communications.

Applications:

EION provides portal based approach applications that are required for billing and monitoring. This will provide the operator or ISP (Internet Service Provider), with tools to monitor the health of the network, user/application performance profile – in real time, and necessary billing applications by measuring the usage of the network.

In addition, EION provides APIs (Application Programming Interface) capable of interfacing with a wide range of commercial applications.

Summary

IP based networks are the foundation of today's digital economy. Evolving a strategy to provide communication services to rural communities in a business-oriented and cost-effective approach is critical.

Rural and remote communities have specific requirements of their infrastructure such as remote upgrades, remote management, and coping with extreme operating conditions. This is unlike the urban communication environments. The most effective pragmatic solution is to provide an evolutionary strategy.

By this, you will quickly deploy IP based networks to provide basic communication services. At the same time, you can evolve the network to provide services such as e-Commerce, Telemedicine or surveillance.

EION is the leader in specialized rural communication infrastructure with wireless products to cover communities with 25 to 50 km radius. In addition, EION's network provides basic Internet, Voice over IP services, video-on-demand and IP based security surveillance. EION gateways interface with VSATs, DSL and optical technologies.

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