

Fiber Internet Center

White Paper

Fiber vs. Copper and Wireless solutions For CEO, CFO, CIO, CTO and your IT People

Introduction

Not a day goes by...that we get asked about the differences between fiber optic services those being offered using wireless and copper-based technologies. This white paper is intended to present information that will provide background about the different technologies with real world information on which to judge which solution is best for a particular environment. Each solution has its strengths and weaknesses. We hope that the information in this white paper will add to the reader's knowledge about what issues are most important when considering upgrading to a faster internet business solution.

Fiber Internet Solutions

Fiber Optic internet connections are generally agreed by most in the industry as the fastest, most secure and reliable internet connection available. Fiber can provide the ability to jump from 1Mbps all the way up to 100Mbps or more. The ability to provide this wide bandwidth pipe is one of the features that sets fiber apart and make fiber ideal for emerging business critical applications such as VOIP and Video. All of the traditional telecommunications providers such as the major cable companies as well as the major RBOC's are upgrading their infrastructures to fiber optics for this ability to support voice, video and data applications.

In the past, fiber optic solutions were expensive. Only the federal government or large enterprise companies could cost justify the cost of pulling fiber to their offices and paying the large minimal costs for having a fiber optic internet connection. Like most other technology areas, the principles of Moore's Law seem to apply. We have seen the cost of fiber drop dramatically over the last twenty years, now making it affordable for the average office to have a fiber internet connection installed.

Copper T-1's and Bonded T-1 Solutions

As businesses have begun to outgrow their T-1 lines, the local telephone providers and ISPs have attempted to add life to their imbedded T-1 infrastructure by offering a bonded T-1 solution. A bonded T-1 solution takes two or more single T-1 lines and combines them. The overall affect is to deliver T-1 services to the client with the ability to deliver 3Mbps or 6Mbps of bandwidth.

Copper-based telecommunications solutions (you can include Business DSL Solutions) are subject to environmental interference caused by weather, electrical or magnetic influences. Bonded T-1's are also affected by each other. In our experience, if just one T1 is having problems, those problems affect the rest of the bonded T-1 connection as the router attempts to shove all the packets across the entire bonded group. If you stop and think for a moment how the router can detect and remove a specific T1 – It works like this...The end user router is sending “test” packets back and forth – but the customers data packets also travel in the same path. What percentage of “test” packets has to be missing before the router determines which T1 should be out of service? It must be more than 1% because 1% by almost any telco standard on any copper based service is considered acceptable. Yes, you heard that correctly, 1% packet loss is acceptable within the copper plant. So while your data packets dropped and the TCP/IP stacks in your servers repeated themselves. The T1 must fail hard enough to be detected across a circuit with busy traffic that is allowed a packet loss from day one. Once this is detected, the router's next task is to send more “test” packets on the bad T1 to see if it should be put back into service. What determines this exactly? With several bonded together all allowed 1% loss what types of critical applications does your company run where factored loss is acceptable? Where the weather outside is allowed to affect your company's productivity?

Let's talk more about the weather and copper infrastructures. Have you ever driven past a box sticking out of the ground and seen a phone service truck near it. Did you stop and take a look at all the wire posts and connectors inside? See any little red connectors or special looking tags? The little red connectors and special looking tags identify T1 services. These are suppose to indicate to others that these are T1 line to any techs that open the box to fix grandma's telephone line when she says it's not loud enough. The team that works the T1s is separate from those that work the Plain Old Telephone Service (often referred to as POTS). So we have 2 different teams of outdoor technicians in these boxes. In busy areas certain boxes are opened and closed again several times a day.

Now how many boxes does your T1 pass through between your office and the Phone Company Central Office (often referred to as CO) ? 6, 10, 12 or more? How many places can a POTS service technician touch your T1 wires by mistake? Can your business connectivity and productivity afford such a mistake? I have seen situations where the tag either wasn't in place, claimed not to be in place, was bumped off and missing, never put in place because upon initial T1 install the outdoor data tech ran out of tags. Months later

the T1 is down and a T1 tech finds after visiting all the boxes in the CO path that another technician took the copper wires, by mistake for someone else's new service needs. In addition to copper wire splice boxes on the ground, you also find them in the air hanging on telephone/power poles. I am sure everyone has seen but not realized that these boxes are places where wires are twisted together to make connections to establish a path back to the CO, just like the ground boxes. Have you ever seen one of these with lots of little wires hanging out. What do you think happens to those wires when the fog rolls in, when it rains, when it's really hot in the summer, when the wind makes all the wires on the pole move around or worse they get covered with ice? Yes, packet lots of packet loss that goes away after the storm. It's a mystery? It's no mystery, it's the weather effecting your data service of choice, copper. Copper expands and contracts with temperature. Copper acts as an antenna and is part of many RF circuits because of this. When a truck drivers CB radio, the radio for an ambulance, police car or fire truck is used near a copper wire the sound can travel upon it. Your T1 data signal is effected. Have you have heard noises out of radio speakers that were not turned on?

Some T1s delivered in large office buildings are fiber to the CO and copper up the buildings infrastructure. These are the most reliable and less likely to be interfered with. Because they are delivered via fiber and only turn to copper for a few hundred feet.

If these potential influences upon copper cannot harm your business productivity then copper is for you. And you might want to check your horoscope to see if your business will continue to succeed.

Wireless Solutions

One of the more recent developments has been the growth of wireless services offered for business services. Without getting into the various technologies, wireless is a way of using radio spectrum to reach a business from a mountain top, cellular site, or other wireless access point. By using both licensed and unlicensed wireless spectrum such as 801.11b or 802.11G, many new emerging companies are offering very attractive solutions to provide business services.

Wireless services typically involve a clear site path to the client from the mountain top or access point location. When wireless was less common, getting a clear path was not a problem and interference from other wireless networks was not a problem. Today, however, wireless is everywhere and it is not uncommon to search for a signal and find 10 or more local wireless access points near you.

The wireless providers in a city generally share the same access point or antenna locations and often have to struggle with other wireless providers to keep their Radio signal paths for interfering with one another. Yes, it's a radio signal. You use one every time you use your cell phone. Do you always have such a nice clean sounding call? If so I need to switch to your cell service. You packets on wireless also travel a "Can you hear me now?" path. Packets are repeated. Packets transmitted from various customers at the same time to the same mountain top or access point create collisions and rebroadcasts.

The more customers the more issues, the less likely services like VOIP , Video and VPNs can be managed.

Since wireless is really radio transmissions, you realize that other radio interference also plays a roll into your business. A simple baby monitor on the same frequency from the condo complex next door could be the cause of your every day at noon the VOIP sounds choppy at nap time. A cordless telephone intermittently throughout the day can have the same effect. Yes, the police car radio, ambulance, etc. driving past all play a roll in your business connectivity issues when you use wireless data services.

In addition, most wireless providers also use DSL or T-1 facilities to supply their access points in order to provide cost effective pricing to their clients. The performance of a wireless access point is also affected by the number of using sharing the network and the bandwidth hogging services they are running. The more users that get added, the more affect there is on the performance of a particular wireless connection.

Along with the growth of the wireless networks, security became a big issue in order to prevent others from hitchhiking on your companies private wireless network or actually trying to hack your companies information. This is commonly discussed, however, it's not very likely if one uses the proper encryption precautions.

While wireless is growing as another low cost solution, it is generally acknowledged that wireless technology is less secure, less reliable, and has less flexible to expand the size of your connection. It's a consumer service, not a business service...and as a consumer I would rather have DSL or a Cable Modem at home. So why would you consider it for your business connectivity?

Fiber is the Solution. Fiber is now affordable.

With fiber circuits there is no acceptable packet loss. Fiber is not effected by the weather. It doesn't expand and contract like copper. Radio waves do not effect you packets traveling on and at the speed of light. Your packets reach the provider regardless of what emergency vehicle is near by. Regardless of what other bandwidth hogging applications your neighbor is running. You get a committed information rate that is yours – not and “upto” speed promise and shared by others.

One of the best things about fiber? Neither the crews that work on copper data services nor the crews that fix standard plain old telephone service ever touch the fiber. The fiber is has it's own separate path from copper. It has special labels warning one of blinding light if it is cut. It rarely shares the same street facilities. Even on power pole it has is own special higher height, away from all other cabling. The same fiber delivered to your business is the same fiber used by the phone company to connect Central Offices together. It's used because it's the most reliable. Copper is not used by the phone company for it's own internal services, so why should you use copper?

Summary

There are engineering and implementation considerations for all of the current internet solutions discussed. Each has its place and can be effective in the right application.

Knowing the trade offs and knowing which solution have the right features and limitations is very important.

Today Fiber is affordable. For the cost of two quality T1s you can have a Fiber connection that will expand as your needs grow.

This information should have helped to provide you with details that most others overlook. The knowledge should help you make the right choice for your company connectivity needs.

Fiber Internet Center
650-330-0428
www.FiberInternetCenter.com