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WHITE PAPER

A Dark Fiber Network Solution

The Challenge:

Provide secure, flexible and economical mission critical high bandwidth services with an infrastructure that is future proof, with an ROI of less than five years and a usable life span of 20 years.

This paper will explain what “Dark Fiber” is and why it is a viable product today, but will soon disappear.

The Facts:

“Dark fiber” is optical fiber infrastructure that is in place but not presently being utilized by its owner. In the simplest terms, it is another name for optical glass fibers that have been installed underground, but do not have any electronics or lasers attached. As these installations are unused, they are described as "dark fiber".

Theoretically, fiber optic cable has the ability to transport an unlimited amount of information. Practically speaking, the generation of the fiber and the laser technology are the factors that limit the capacity of the fiber. From the early 80s to the late 90s, there were a number of vast improvements in fiber optic cable manufacturing. For long haul networks, there was a significant milestone in the late 90s. Non-Zero Dispersion Shifted fiber was developed and began widespread deployment in 2000. This fiber is optimized for Dense Wave Division Multiplexing applications which will enable Non-Zero Dispersion Shifted fiber to can carry as much as Terabits of data per second that is 1,000,000,000,000 bits per second.

Recent developments in optical equipment has vastly increased the value of dark fiber. In the late 80s and early 90s, the amount of information that could be placed on a single standard single mode fiber was 2,500Mb. When the provider reached that limit, another fiber had to be activated with a new set of electronics and lasers. In the mid 90s, a new technology emerged that increased the amount of information that could be transported on fiber by a factor of 160. This technology was Dense Wave Division Multiplexing (DWDM). This technology allowed a user to create 160 separate channels on a single fiber cable. Other improvements in optical encoding have also allowed each channel to transport up to 100Gb per second. This can only be achieved with Non-Zero Dispersion



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Shifted fiber. Other fiber can be used but the performance of the equipment can be degraded by as much as a factor of 10. Cost would also be increased due to the need of special equipment to enable older fiber to perform at this level.

“Lit services” are managed services delivered over fiber optic cables that are managed by a telecommunications service provider. These services range from legacy 1.54 and 45Mb services all the way up to 1000Mb Ethernet circuits. The fee structure for lit services is based on the amount of bandwidth and the distance that information is to be moved. For high bandwidth users, these fees can add up to be millions of dollars a month.

Dark fiber only proves to be a financially sound investment if the user needs to move large amounts of data in secure fashion.

The telecom and dot-com boom of the 1990’s left a wealth of underutilized national and international fiber infrastructure (*Dark Fiber*). Large enterprise companies have the opportunity to capitalize on these unused fiber assets to bring unprecedented and unlimited connectivity/bandwidth to their company domestically and around the globe.

Fiber was once used exclusively by large telecommunications carriers to provide network services and capacity to their business and residential customers. The sizing and capacity of the network was controlled by the telecommunication company. The network capacity was determined by how much money could be made from a single customer, not how much bandwidth was needed by the customer. With the explosive growth of the Internet, the large carriers have been unable to support this growth and thus limit the potential of the network.



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The Solution:

With the convergence of many events such as the development of advanced fiber technologies and the availability of dark fiber comes a new solution to the market that was never available before.

A dark fiber network solution will provide secure, economical connectivity in the US and around the globe. The total cost of ownership of a dark fiber-based optical transmission system/network is far more economical than leasing telecommunications services over the terms of the existing contracts.

Leased services include any fiber optic services that are procured from a telecommunications service provider. Leased services are billed on a monthly recurring schedule, typically come at a premium, and are limited to the size of the bandwidth leased. As the bandwidth requirements of enterprise companies increase, a dark fiber solution would provide the ability to upgrade bandwidth and service level options without increased monthly costs.

Enterprise companies can utilize the existing, unused dark fiber capacity to provide a much more robust, instantaneous, on-demand bandwidth network for a lower cost than what is currently being provided by the existing telecommunications companies. Along with these benefits, augment the capacity and flexibility of their wide area networks (WAN). These private networks could then be connected to the legacy public networks at carrier hotels to be used as gateways for communications providers around the globe. Owning dark fiber, the enterprise company could turn up additional circuits, and potentially have unlimited capacity with a moment's notice. Dark fiber is just the medium on which the waves of light travel. It is technology neutral. Any application and any protocol can be transmitted over dark fiber, so the investment and its capabilities are protected long into the future.

Summary:

There are five distinct attributes of a dark fiber network:

- Security
 - Dark fiber routes are constructed in such a fashion that access can only be obtained at the end points opposed to a public network with multiple public access points.
- Route Diversity
 - The dark fiber network is a fully redundant fiber path fulfilling all US Military route diversity requirements.



- Scalability
 - Enterprise company owned transmission equipment determines how much bandwidth is available, not the telecommunications company. This solution gives the user the ability to upgrade from 1 Gb to 10 Gb or 800Gb by executing a software command in your equipment. No longer will the enterprise company be bound by the public telecommunications out-dated equipment and infrastructure.
- Maintenance
 - The network fiber has been placed within the last 8 years and utilizes the latest in fiber optic cable technology.
- Delivery Interval
 - The dark fiber network route is currently in place; only the entrances or “laterals” in most cases will need to be constructed positioning the dark fiber network with the highest probability of on time delivery.

Enterprise companies need to act now and move forward with a dark fiber network. Timing is critical as bandwidth needs increase and the availability of dark fiber decreases.