TECHNOLOGY FUTURES INC.

The Role of xDSL Technology

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A group of technologies generically referred to as xDSL (digital subscriber line) allows the economical provision of high-speed digital access services over existing copper telephone distribution cable. These technologies will play a significant role in making digital services available to widely dispersed residential subscribers over the next several years. However, they also have significant technical and economic disadvantages that restrict their role in the long run—at least as applied to extending the useful life of cooper cable.

In spite of copper's current usefulness, there are theoretical capacity limits in the telephone plant that cannot be overcome according to the laws of information theory. The limits are in terms of the amount of information (bit rate) for a given distance (measured in kilofeet).

Data Rate	Maximum Distance	Comments
1.5 Mb/s	18 Kft.	Can theoretically reach most, but not all, homes. Practical limits mean fiber feeder is often required.
6.0 Mb/s	10 Kft.	Shorter than the average loop length. Generally requires fiber feeder.
24 Mb/s	3 Kft.	Requires fiber well into the distribution plant.
55 Mb/s	1 Kft.	Basically implies fiber-to-the-curb.

Service at 1.5 Mb/s may be sufficient for the average Internet user today, and 6.0 Mb/s would be a dream. However, these rates will be sufficient in the future only if the technological progress we have seen over the past 15 years in computers, multimedia applications, and the Internet diminishes significantly. This seems unlikely. Historical and current trends in modem rates, computer performance, and memory usage suggest that performance requirements will double—on average—every two years. Assuming that 1.5 Mb/s is acceptable today and using this rate of improvement going forward, users will be demanding 24 Mb/s and above within a decade.

The interaction of the technical limits and the increasing demand for higher data rate digital services is treated in our recent report, *Transforming the Local Exchange Network, 2nd Edition*. A range of scenarios was developed that captures alternative strategies for application of xDSL. The middle scenario, for example, assumes a very substantial role for xDSL with a rapid early rollout in the next five years and subscribership to xDSL-based services reaching 10% of all homes by about 2007. However, the combination of higher data rates and the constantly improving economic advantages of fiber begin to force LECs to fiber-intensive solutions well before 2007.

One should also be aware that xDSL does not come free of charge. Because of a combination of theoretical and engineering limitations, even the 1.5 Mb/s and 6 Mb/s rates will require extensive deployment of fiber in the feeder, as well as the replacement of existing circuit equipment. Further, in some cases, distribution and drop facilities will need to be rehabilitated. In addition, the cost of the xDSL electronics—in both the network and the customer premises—is significant.

Given the limited willingness-to-pay of residential customers, there will be only so much revenue to cover these costs. While costs are likely to come down, so will the costs of competing technologies such as cable modems. Thus, xDSL is a generally attractive interim solution to a particular problem, but not a panacea that overcomes all the competitive challenges facing telephone companies today—especially in the long run.

If you believe that TFI could be of assistance to your organization in developing a fast follower strategy, please contact Larry Vanston, John Vanston, David Smith, or any other member of the TFI consulting staff.