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Emerging Broadband Technologies For Triple Play Service Deployment

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The Emergence of Broadband DSL

Over the last decade, most broadband has been deployed to address the data throughput needs of the booming Internet market. Asymmetric digital subscriber line (ADSL) is the first broadband technology to be largely deployed to meet these needs. ADSL connections have a typical aggregate (downstream and upstream) rate of 8 Mbit/s on an up to 10 kft loop, down to 1 Mbit/s on an up to 18 kft loop.

Recently, service providers, including ILECs and CLECs, have started to deploy higher throughput connections that meet the newly adopted ADSL2+ standard. An aggregate 25+ Mbit/s rate can be achieved on some loops with ADSL2+, mostly due to the use of larger transmission bandwidth. A few years ago, Centillium introduced a new ADSL broadband technology called ADSL2++, allowing users to achieve an aggregate 50 Mbit/s rate on a short loop. This technology uses a QUAD band plan compatible with ADSL2+ and some more advanced coding techniques.

The emergence of Internet broadband technology has changed the lives of over 150 million users during the last four years, and subscribers are increasingly demanding data delivery at higher speeds. Interestingly, broadband DSL adoption has grown much faster than mobile phone adoption. It took mobile phones about five and a half years to grow from 10 million to 100 million subscribers worldwide. Broadband DSL has achieved the same growth in less than four years (Source: Point Topic). Thus, broadband DSL has established itself as one of the fastest growing new technologies in history.

Evolving Toward Triple Play

Due to the already increasing capability of data throughput, some service providers now aspire to provide more content to their subscribers, and are starting to upgrade their networks to support the “triple play” strategy of delivering data, voice and video. Higher bandwidth content such as real-time Internet gaming, TV-over-DSL (TVoDSL), Multimedia-over-DSL (MoDSL) and high-bandwidth business applications add to the overall demand for faster and cheaper DSL technologies.

Deployment of ADSL2+ offers a service provider the possibility of delivering real-time digital TV (DTV) on a short loop with its current copper infrastructure, but it can provide only a limited number of channels in only a standard TV format. Because of the increasing demand for DTV and video services – both in terms of the number of concurrent standard format channels and high-definition format (HDTV) channels – higher-speed network infrastructures are starting to be deployed by telephone operators around the world. Fiber to the home is the ultimate solution for service providers wishing to build future-proof networks. However, in some cases, service providers are taking a more gradual path to future-proof networks by building hybrid fiber/copper networks. In this scenario, the service provider may deploy fiber very close to the customer’s home and then use the existing copper infrastructure to connect the last few hundred kft. VDSL2 was primarily conceived to fill this role, building on the tremendous legacy of ADSL deployments and the convenience of working with shorter copper loops.

ITU-T further decided that the framing structure for VDSL2 should be based on ADSL2 to allow easier interoperability with the vast array of ADSL solutions already deployed worldwide. Although VDSL2 is primarily desired for usage in shorter copper loop applications off of a fiber terminal in the loop or in the basement of a multiple dwelling unit, its usage can become more widespread over time when it becomes as cost-effective as its ADSL counterpart.

Different Access Networks for Different Needs

Figure 1 shows a few access network architecture scenarios. The most traditional of these networks today involves the use of copper between the central office (CO) where there is DSLAM and the customer premise equipment (CPE), as in Scenario 1. The limitation of this approach is the decrease in data rate as the length of the twisted pair wire increases.

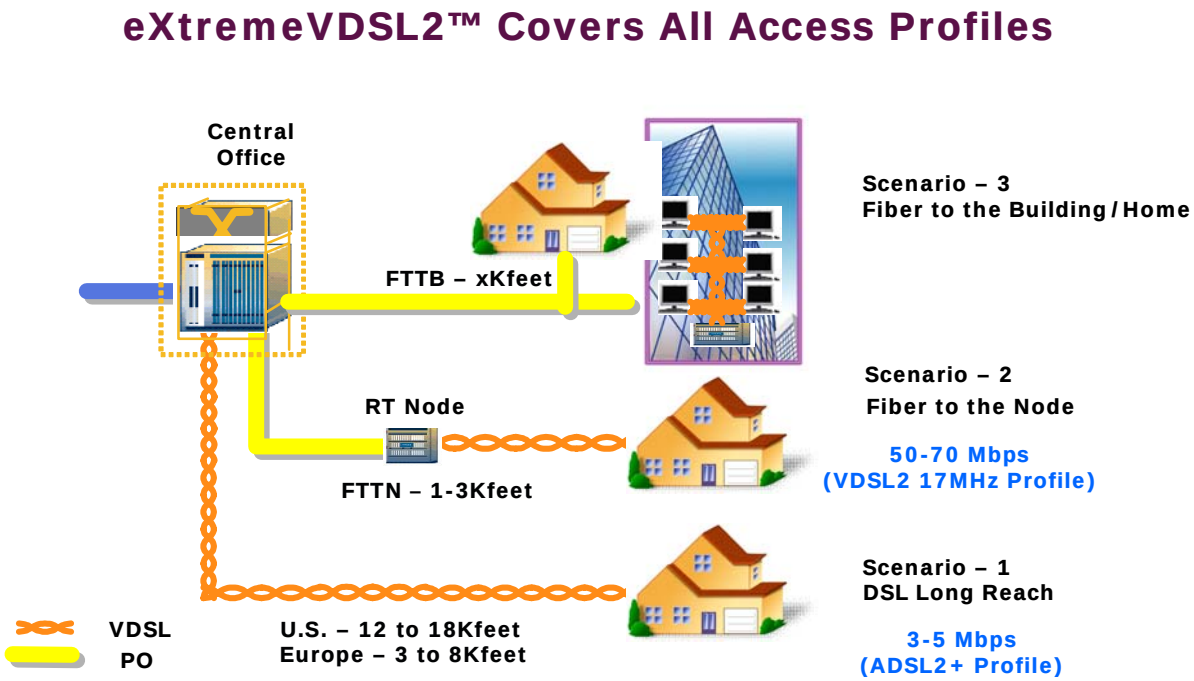

Figure 1: Different Access Network Architectures

In the second scenario, fiber to the node (FTTN) is used from the CO up to the remote terminal (RT), and twisted pair wire is used from the RT to the subscribers. Higher data rates are possible because of the shorter line between the RT and the subscribers. Therefore, the possibility of delivering triple play content to the subscribers exists. In this scenario, operators are able to use a technology such as VDSL2 or ADSL 2++, which will allow over 70 Mbit/s at 3 kft.

The third scenario shows the fiber to the home network (FTTH). In this case, the fiber is terminated at the customer's home or office, which gives the user virtually unlimited bandwidth. Passive optical networks (PON) are utilized to cost-effectively build FTTH networks.

xDSL Market Projections

In 2004, the number of new xDSL lines deployed globally was 32.8 million, resulting in a total of 96.8 million lines deployed at the end of 2004. The total annual revenue for xDSL ICs was over $800 million in 2004.

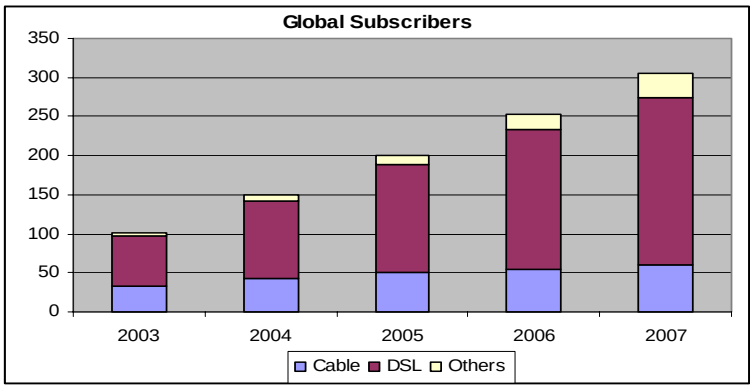

Figure 2: Broadband Connection Study

By the end of 2005, as shown in Figure 2, the total broadband market size will exceed 200 million lines. Comparatively, xDSL will be the leading broadband technology, with over 70 percent of the world's mass market broadband subscribers. It will be followed by cable modems (25 percent) and gigabit Ethernet, wireless broadband and others (5 percent combined). Looking further, broadband xDSL will be the No. 1 delivery mechanism for broadband to the home.

On a worldwide basis, as of the end of Q2 2005, ADSL is the most widely deployed DSL service. Based on various market studies, ADSL end-to-end ports accounted for over 80 percent of all DSL end-to-end ports installed worldwide. Over the next few years, extensions of ADSL, such as ADSL2+ and ADSL2 Annex L (reach-extended ADSL2), will continue to make up the bulk of deployments to achieve 50 percent of the total market by 2007.

Over the next few years and on a worldwide basis, triple play will become the standard package of choice for consumers who want to take advantage of their broadband connections. The simplicity of getting all applications from a single provider is an even more valuable proposition.

Although triple play is being delivered today over ADSL technology, VDSL2 can provide more bandwidth when the copper lengths are very short. Figure 3 shows a comparison of the different DSL services with regards to data rate and use of bandwidth spectrum. In the downstream direction, ADSL2+ allows service providers to offer customers some triple play services (like streams of TV-quality video at 3 Mbps, plus a few Mbit/s for data and voice). At up to 5 kft, ADSL2++ allows delivery of HDTV-quality service (a few streams of HDTV-quality video, plus a few Mbit/s for data and voice). VDSL provides bandwidth advantage relative to ADSL2+/2++ up to approximately a couple of kft.

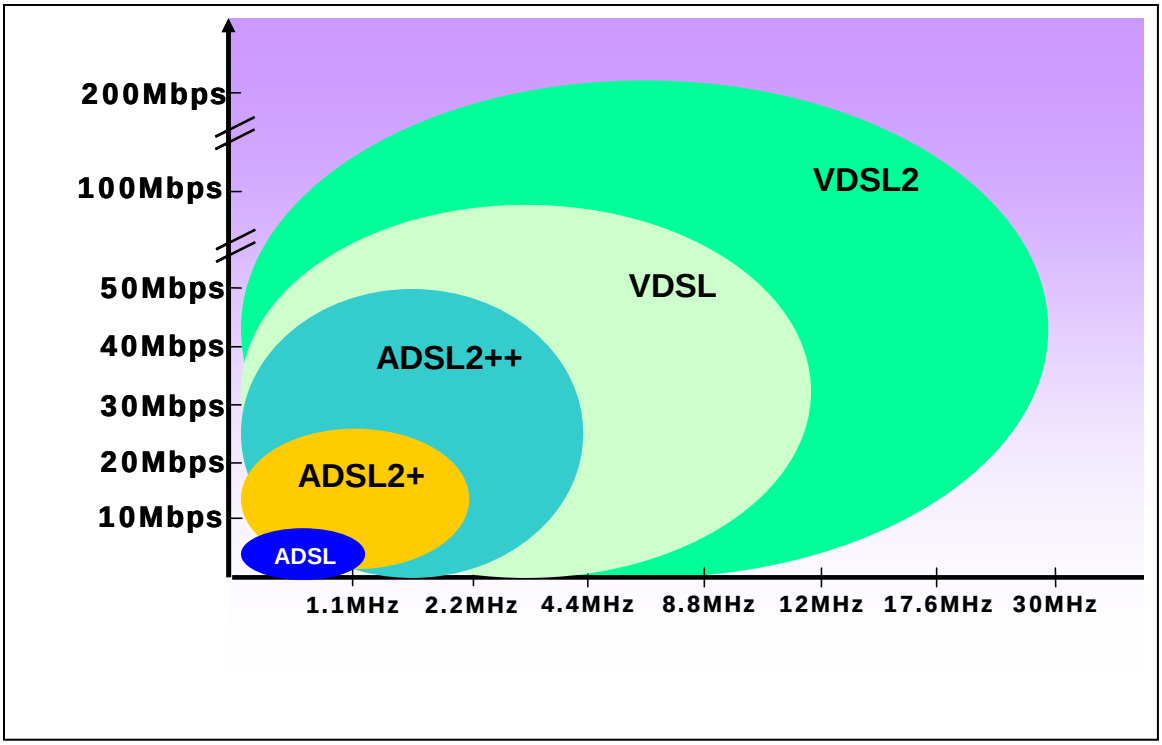

Figure 3: DSL Service Data Rate vs. Frequency Bandwidth

Introducing eXtremeVDSL2

In May 2005, the ITU approved the new VDSL2 standard, which allows the use of different frequency bandwidths and power spectrums to respond to the deployment demands of operators. Multiple profiles are defined in the VDSL2 standard, with frequency band plans from 8.8 MHz up to 30 MHz, allowing Scenarios 1, 2 and 3 (Figure 1) to be addressed in the most optimal way. For the very short loop of a few hundred feet, the 30MHz band plan will achieve over 100 Mbit/s symmetrical, allowing the subscriber to take advantage of the full capacity of its Ethernet connection. For the longer loop of a few kft, as an example, the 8.8MHz band plan will achieve an aggregate rate of over 30 Mbit/s at 3 kft.

The significance of VDSL2 is not only apparent in the improvement of data rate compared to the former VDSL standard, but also in the addition of more efficient framing and trellis coding as well as improved impulse noise protection, allowing to achieve better reach and more robust data delivery. Another significant change from the previous VDSL standard is that this time, backward compatibility with ADSL is required, and therefore significant reuse of the existing consumer equipment is expected and required.

With the introduction of eXtremeVDSL2, Centillium will provide the next generation of DSL platforms to support all standards shown in Figure 3, with additional features to improve performance and provisioning. As an example, service providers will be able to attract future customers by providing them with some basic services at a low cost, and later offer them an upgrade via software download to respond to demands for new services like DTV, VoIP, etc. This will provide revenue generation for the service providers while significantly reducing provisioning and operating expenses.

Conclusion

The market demand for triple play services is driving the broadband industry to quickly deploy new technology like VDSL2 to support the need for high data rate capabilities in a more effective way. Operators are responding to the market demand while they are looking at reducing overall costs in terms of provisioning and network management.

Centillium's response to this emerging triple play market is the introduction of the feature-rich eXtremeVDSL2 technology to support all DMT DSL standards and provide a unique solution for future broadband access network deployment. By covering all requirements in terms of performance, power and port density, the eXtremeVDSL2 chipset provides a very competitive solution to equipment manufacturers and operators due to its software configuration and upgrade flexibility.

Future deployments of high data rates will increase the need for FTTX network equipment. Looking at Centillium's product portfolio, the company is well-positioned to address all FTTX markets with its PON technology, its VoIP technology and its recently announced eXtremeVDSL2 technology.