



Annex M Technology

- enabling higher upstream speed
by increasing the available frequency range

White Paper



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Standard Brief

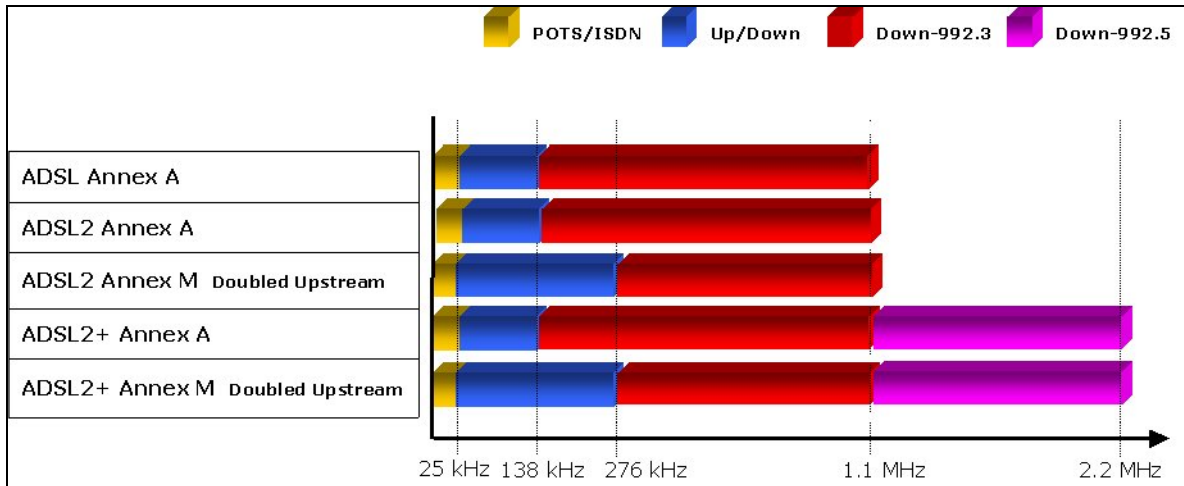
ITU-T (ITU Telecommunication Standardization Sector) ADSL2/2+ Annex M specifies a new standard for ADSL services over POTS (Plain Old Telephone Service) by doubling upstream data rates. Through this new technology, service providers can create and offer value-added but bandwidth-consuming services, such as video conferencing, VoIP, VoD (Video on Demand) etc. One of the greatest advantages is that users do not have to suffer traffic congestion while enjoying these services as well as surfing the Internet. Moreover, with doubled upstream bandwidth, an ordinary user can be their own service providers by setting up a media server center and delivering video programs for remote access.

ADSL Standard Compliance

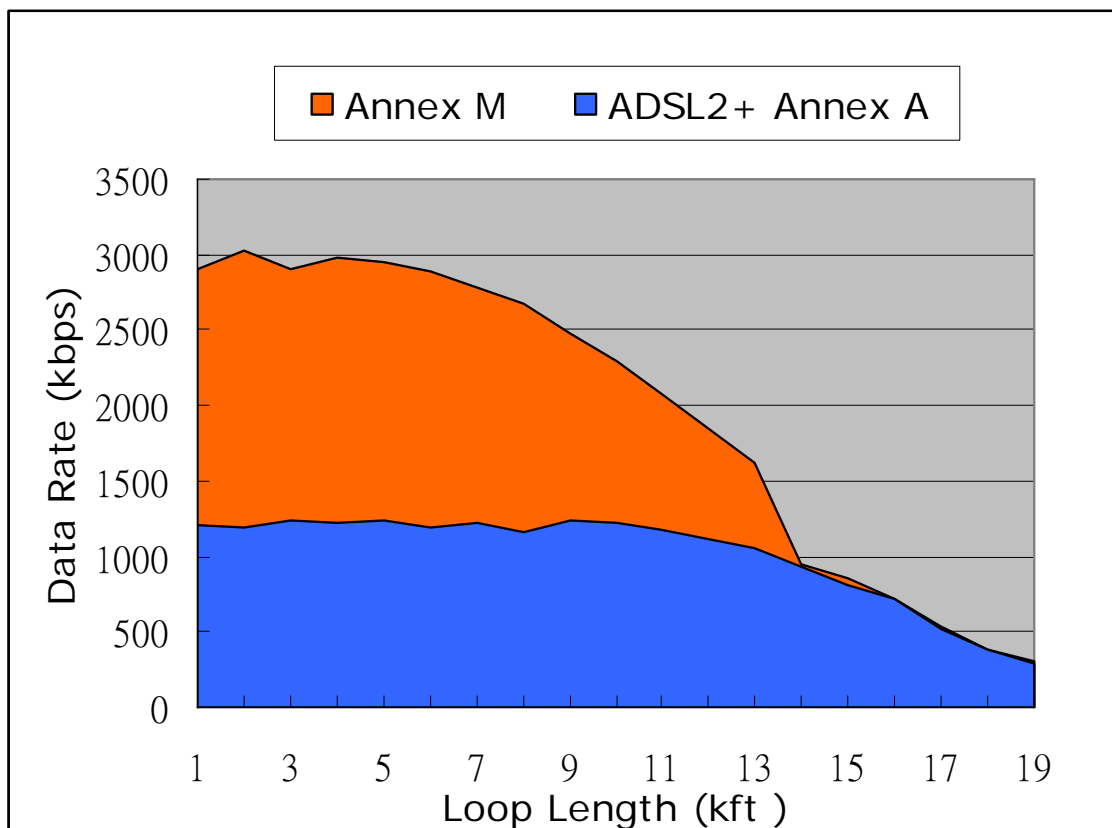
Standard	Downstream rate	Upstream rate
G.992.1 ADSL	8Mbit/s	1Mbit/s
G.992.3 ADSL2	12Mbit/s	1Mbit/s
G.992.3 ADSL2 Annex M	12Mbit/s	2.5Mbit/s
G.992.5 ADSL2+	24Mbit/s	1Mbit/s
G.992.5 ADSL2+ Annex M	24Mbit/s	2.5Mbit/s

Shifting Frequency to Higher Upstream Speed

Annex M is an extension of the G.992.5 ITU-T International Telecommunications standard. It enables higher upstream speeds by increasing the available upstream frequency range. To double upstream bandwidth, Annex M shifts 138KHz from a downstream frequency to an upstream frequency. Therefore, upstream bandwidth can range from 25KHz to 276KHz.



Take Billion's BiPAC 7402G for example, the comparison of ADSL2+ test result between Annex M and Annex A shows the difference. It's found that at the loop length of 1Kft, Annex M's upstream data rate can reach as fast as up to 3,000Kbps whilst Annex A reaches 1,100Kbps. At 18Kft, Annex M's upstream data rate can even reach up to 300Kbps, which is slightly higher than 290Kbps that Annex A can reach under the same loop length.



Note: The corresponding CO DSLAM is embedded Conexant chipset. Under ideal conditions, the upstream rate can reach as much as up to 3Mbps with ADSL2+ Annex M.

Benefits & Applications

Billion's ADSL products with integrated Annex M technology are fully compliant with the G992.3 ADSL2 and G.992.5 ADSL2+ Annex M standards, offering the possibility for service providers and users to expand their imaginations in terms of creating diversified services and applications.

➤ **High-speed upstream data rate**

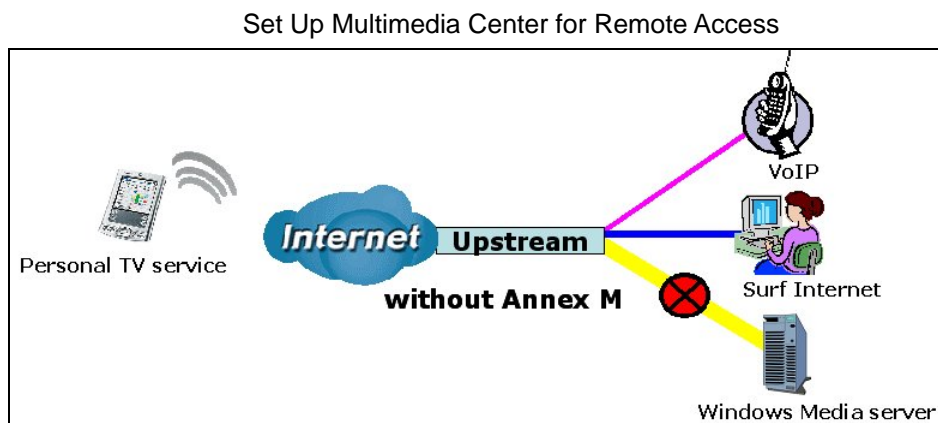
By increasing the upstream data rate to approximately 2.5Mbps (up to 3Mbps under ideal conditions), users can experience faster and smoother data transmission. Users do not have to suffer traffic congestion when sending and receiving important data or video streams.

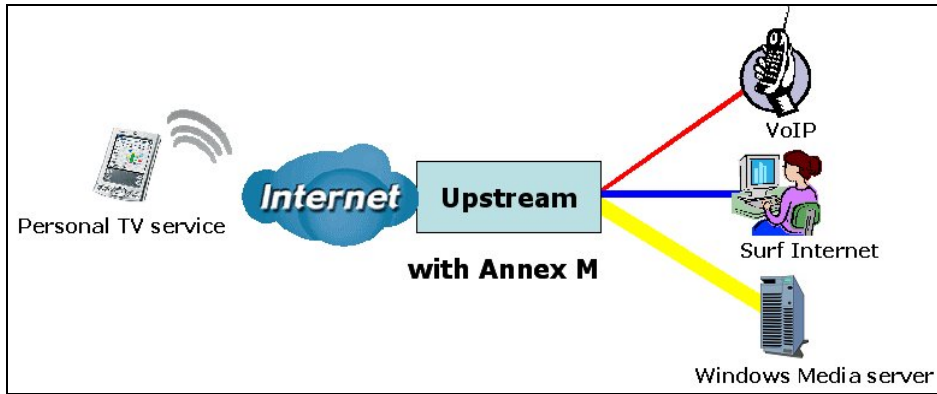
➤ **Cost-Saving**

To address business users' needs for efficient and cost-effective network services, Annex M provides an alternative connection to T1 or G.SHDSL that delivers similar upstream bandwidth but cost a lot more.

➤ **Triple Play Services**

With the increased upstream data rate, service providers can not only create and offer Triple Play services, but general users can be their own service provider. Mobile users can easily set up a media server center at home broadcasting video programs to the Internet, so they can watch the shows remotely on laptop or PDA devices.





Billion's Annex-M-included Products

Ideal for Home/SOHO/Office Users

Model Name	Annex M	Wireless	VoIP	VPN
BiPAC 7402R2	V			
BiPAC 7402G	V	V		
BiPAC 7401VP	V		1FXS, 1FXO	
BiPAC 7401VGP	V	V	1FXS, 1FXO	
BiPAC 7404VP	V		2FXS, 1FXO	
BiPAC 7404VGP	V	V	2FXS, 1FXO	
BiPAC 7404VGO	V	V	2FXS, 1FXO	V

Ideal for Home/SOHO Users

Model Name	Annex M	Wireless	VoIP	QoS/EZSO
BiPAC 5200S	V			
BiPAC 5200	V			
BiPAC 5200G	V	V		
BiPAC 7300	V			V
BiPAC 7300G	V	V		V
BiPAC 7300VP	V		2FXS, 1FXO	V
BiPAC 7300VGP	V	V	2FXS, 1FXO	V

Note: The actual data rate of Annex-M products may depend on varying DSLAMs and network environments.