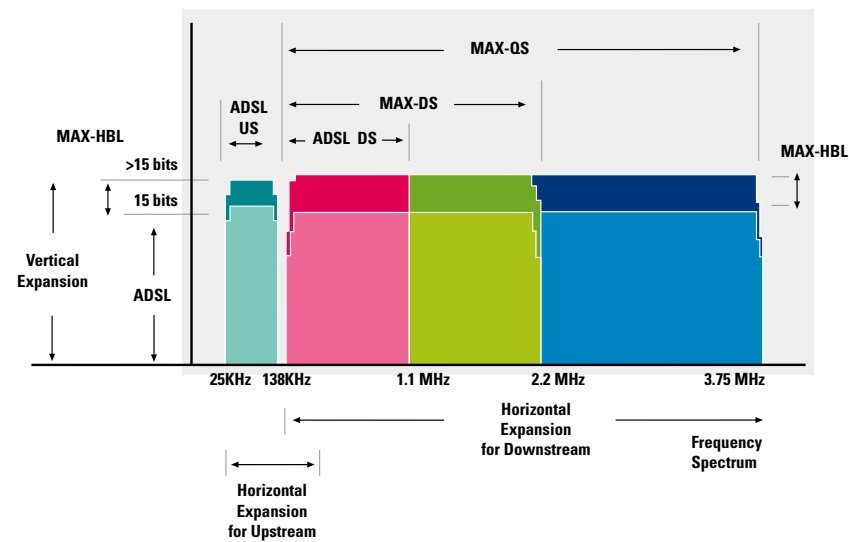


eXtremeDSL^{MAX} technology maximizes the use of the DSL channel capacity to deliver the highest bit rate possible for any given loop condition. The actual performance of ADSL service depends upon many physical factors such as available spectrum, subscriber distance from the Central Office (CO), and noise condition surrounding the subscriber metallic loop.

- The MAX-HBL feature provides increased efficiency across the spectrum. Based on the ITU-T G.dmt standard, bit loading is limited to 15 bit per DMT tone, whereas MAX-HBL allows greater than 15 bit loading.
- With the MAX-DS feature, the spectrum for downstream is doubled compared to ADSL.
- With the MAX-QS feature, the spectrum for downstream is quadrupled compared to ADSL.
- Similarly, with the MAX-EU feature, the spectrum for upstream is doubled compared to ADSL.

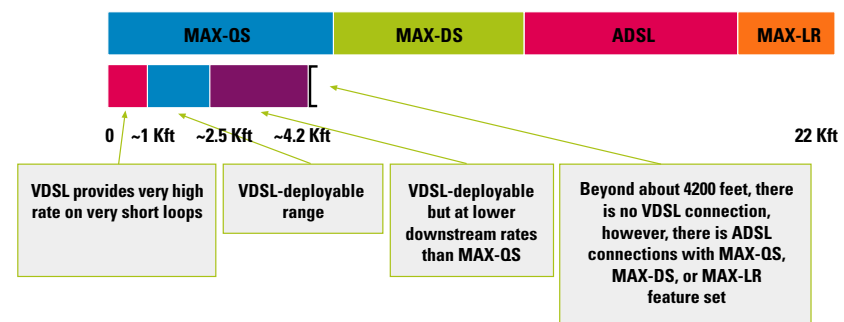
eXtremeDSL^{MAX} Spectrum Efficiency



The eXtremeDSL^{MAX} MAX-QS feature enables the delivery of "VDSL-like rates" for short loops with ADSL economics. Beyond approximately 4,200 feet, VDSL runs out of upstream bandwidth, making it unattractive for deployment for medium to long loops. Beyond approximately 2,500 feet, MAX-QS outperforms VDSL.

The eXtremeDSL^{MAX} covers a broader range of market segments for the DSL market compared to VDSL while it matches its downstream rate of up to 50Mbps rates.

eXtremeDSL^{MAX} versus VDSL Performance



Glossary of Terms

- **ADSL:** Asymmetrical DSL based on ITU-T G.992.1 (G.dmt)
- **ADSL2:** ADSL based on ITU-T G.992.3 (bis extensions to ADSL)
- **ADSL2plus:** ADSL based on ITU-T G.992.3 & G.992.5
- **WLAN:** Wireless LAN feature for CPE based on 802.11x
- **VoP:** Voice Over Packet for CPE to support multiple telephony lines
- **STB:** Set Top Box to deliver video-type applications



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What is eXtremeDSL^{MAX} ?

eXtremeDSL^{MAX} is Centillum's innovative technology that redefines the performance capabilities of DSL by an efficient use of the DSL spectrum.

What is the Significance of eXtremeDSL^{MAX} ?

This technology accelerates the introduction of new premium services such as High Definition Television (HDTV), Video on Demand (VoD), Voice over Packet (VoP), and Video & Audio Streaming, in addition to very fast and always-on Internet access for consumers over the metallic loops.

eXtremeDSL^{MAX} technology is backward compatible to ADSL2 and ADSL2plus, allowing service providers to also benefit from using their existing ADSL infrastructure.

The technology is intelligently designed to allow an expansion of ADSL, ADSL2 and ADSL2plus service coverage, enabling the service providers to increase their revenue through increased subscriber base.



eXtremeDSL^{MAX} Benefits:

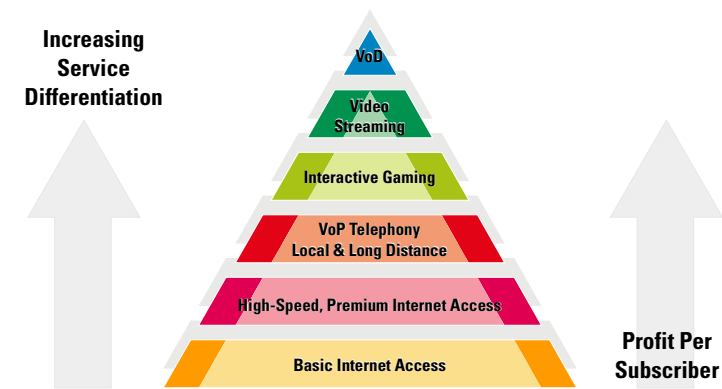
- Delivers bit rates up to 50Mbps downstream and up to 3Mbps upstream
- Allows delivery of triple-play services (video, telephony, data) at ADSL economics/costs
- Uses existing ADSL infrastructure
- Increases the service area coverage for premium services such as 12Mbps, and 24Mbps
- Extends the reach of ADSL service up to 22,000 ft. (7,000 m)
- Enhances the robustness of ADSL connections
- Enables flexible traffic management schemes
- Builds upon existing ITU-T ADSL G.dmt and newly agreed G.dmt-bis standards
- Backward compatible to ADSL, ADSL2, and ADSL2plus

Centillium uses a combination of innovative algorithms, silicon, software, and firmware to deliver eXtremeDSL^{MAX} features. The list of features is as following:

- Quad Spectrum (MAX-QS)
- Double Spectrum (MAX-DS)
- Extended Upstream (MAX-EU)
- High Bit Loading (MAX-HBL)
- Long Reach (MAX-LR)

eXtremeDSL ^{MAX} Feature Set	Remarks	Benefits
Quad Spectrum (MAX-QS)	<ul style="list-style-type: none"> • Enables delivery of ADSL downstream rates of up to 50Mbps using Quad Spectrum mode • Uses frequency spectrum from 138Khz to 3.75Mhz for downstream 	<ul style="list-style-type: none"> • "Video-rates" with ADSL technology: Up to 50Mbps downstream for delivery of video type services for short loops • Service coverage area extension for premium services: Increase ADSL2plus reach for 24Mbps service by 700% (under 24 disturber noise conditions)
Double Spectrum (MAX-DS)	<ul style="list-style-type: none"> • Enables delivery of ADSL downstream rates of up to 24Mbps using Double Spectrum mode • Uses frequency spectrum from 138Khz to 2.2Mhz for downstream 	<ul style="list-style-type: none"> • ADSL2plus technology: Up to 24Mbps downstream for video type services for short-medium loops • Service coverage area extension for premium services: Increase ADSL reach for 12Mbps service by 700% (under 24 disturber Noise conditions)
Extended Upstream (MAX-EU)	<ul style="list-style-type: none"> • Enables delivery of ADSL upstream rates of up to 3Mbps using Extended Spectrum mode • Uses frequency spectrum from 25Khz to 276Khz for upstream 	<ul style="list-style-type: none"> • Higher upstream rate for ADSL power users: Up to 3Mbps upstream for peer to peer applications
High Bit Loading (MAX-HBL)	<ul style="list-style-type: none"> • Enables ADSL DMT bit loading of more than 15 bits per tone 	<ul style="list-style-type: none"> • Enables delivery of higher bit rate with increased bit loading: up to 20% increase in rates
Max Long Reach (MAX-LR)	<ul style="list-style-type: none"> • Enables delivery of ADSL service with reasonable rate up to 22,000 ft. (7,000 m) 	<ul style="list-style-type: none"> • Extended ADSL service coverage for long-loop subscribers: 20% increase in ADSL reach

Broadband Services Value Chain

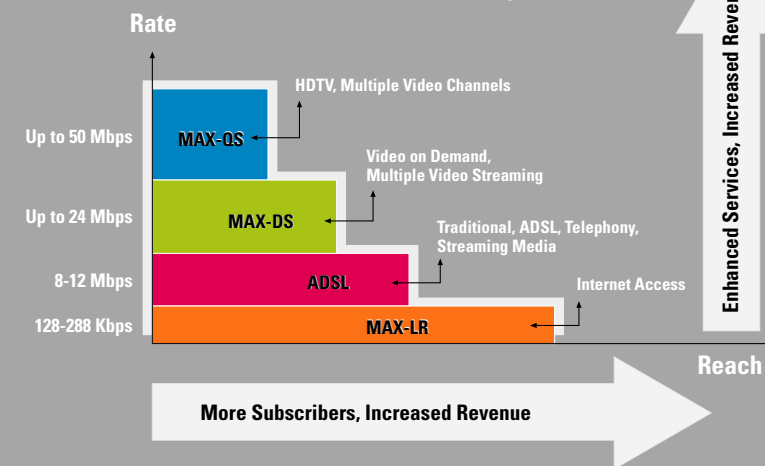


eXtremeDSL^{MAX} technology enables service providers to roll out exciting new services to consumers, significantly increasing their Average Revenue Per User (ARPU).

Value-add services for the mass market can be bundled over a single DSL line to offer a combination of video, telephony, and data (triple-play) services.

A variety of new residential multi-application Customer Premise Equipment (CPE) will become available such as DSL cordless phones or DSL routers with any combination of WLAN, VOP, or STB interfaces or integrated functions.

ADSL Rates & Triple-play Services

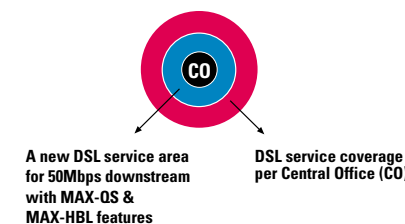


eXtremeDSL^{MAX} technology maximizes the use of the DSL channel capacity to deliver the highest bit rate possible for a given loop condition. The actual performance of the ADSL service depends upon many physical factors such as available spectrum, subscriber distance from the Central Office (CO), and noise condition surrounding the subscriber metallic loop. The MAX-HBL feature provides increased efficiency for all scenarios.

- With MAX-QS feature, bit rates up to 50Mbps are delivered for shorter loops.
- With MAX-DS feature, bit rates up to 24Mbps are delivered for short-to-medium loops.
- For ADSL with high bit loading, up to 12Mbps are delivered for medium loops.
- With MAX-LR feature, bit rates above 128Kbps are delivered to long to very long loops.

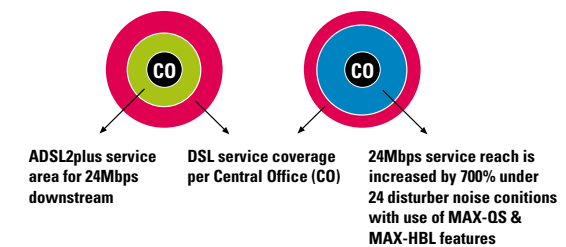
ADSL Service Coverage

Scenario 1 : Creating new DSL service area with MAX-QS



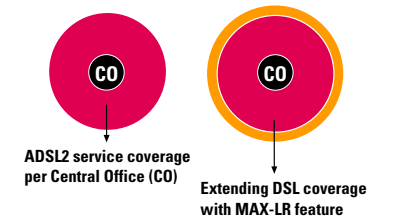
eXtremeDSL^{MAX} creates a new premium service area of 50Mbps downstream bit rates for subscribers closer to Central Office (CO) within the DSL service coverage. This service area is enabled through the MAX-QS and MAX-HBL features.

Scenario 2 : Extending DSL service areas with MAX-QS



ADSL2plus allows the delivery of up to 24Mbps downstream bit rates. Using eXtremeDSL^{MAX} MAX-QS, the reach of 24Mbps is increased by 700% (under 24 disturber noise conditions) as opposed to the reach provided by ADSL2plus (ITU-T G.992.3 & G.992.5) alone.

Scenario 3 : Extending DSL service coverage with MAX-LR



Using MAX-LR, the DSL service reach per Central Office (CO) is increased by 20% as compared to ADSL2.