
TITLE **The position of the Dutch operator on SDSL**

PROJECT SDSL

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ABSTRACT SDSL becomes attractive for KPN if it will be a product that can transport broadband services to the SOHO (and consumer) market. Simultaneous transport of **telephony signals** is therefore our key-requirement. Telephony must be transported **inband** the data stream to outperform ADSL under equivalent noise conditions. Features such as Nx64 kb data transport (without telephony), G.703 interfacing, low jitter and wander, are no more than "nice-to-have" features because HDSL (or an updated version) can handle this adequately.

1. Problem description

During the previous two ETSI-TM6 meetings, various operators have presented their wishlists for possible SDSL requirements. The combined wishlist has grown to a list that identifies nearly everything between (and including) HDSL and ADSL. There is definitely a clear demand for a new type of xDSL product, but if SDSL must simultaneously fulfill all the requirements in these wishlists, it may become a complex and lengthy standardisation process.

In an attempt to prevent this, KPN has separated their wishes on SDSL into **key-requirements** and features that are **nice-to-have**. Our key requirements are focussed on applications that are essential and viable, and will probably represent the majority of the expected applications. These applications have delivery of telephony + data in common, with the SOHO (and consumer) market as objective.

- Telephony = POTS or ISDN (2B+D)
 - Data = fast internet, interactive multimedia, symmetrical real-time multimedia, video services, etc.
- HDSL is not suitable for this combination, and ADSL performs insufficiently in uplink bitrate and in range when combined with ISDN.

The 'nice to have' features should not be implemented if they significantly deteriorate one of the following aspects (in no particular order)

- Time to market
- key-requirements
- price per link

2. Key requirements

SDSL must become a system that is significantly different from HDSL and ADSL, so that it cannot be covered by an update of the current HDSL or ADSL standards. Support of inband telephony (POTS or ISDN) is our most striking requirement. Especially the possibility to deliver **ISDN in combination with broadband data** is crucial, and the reduce range performance of "ADSL over ISDN" makes that it cannot fully cover our demands. The table below relates typical SDSL characteristics with HDSL and ADSL, and identifies the KPN key requirements.

Typical characteristics

HDSL	SDSL	ADSL
medium & enterprise business	SOHO-market, possible as consumer product	Consumer product, introduction in SOHO market
Guaranteed performance	Best effort	Best effort
optimal balance between bitrate & distance	optimal balance between bitrate & distance	sub-optimal , due to window for POTS or ISDN (KPN estimates that ADSL over ISDN reduces the range with about 30%, compared to ADSL over POTS)
leased lines (high quality) <ul style="list-style-type: none"> LAN-interconnect ISDN-30 	Data: (IP-based services) <ul style="list-style-type: none"> Fast Internet interactive multimedia symmetrical real-time multimedia Telephony: (embedded in bitstream) <ul style="list-style-type: none"> inband POTS inband ISDN 	Data: (IP-based services) <ul style="list-style-type: none"> Fast Internet interactive multimedia Telephony: in lower band <ul style="list-style-type: none"> ADSL over POTS ADSL over ISDN
Interfaces G.703:	Interfaces: Ethernet (10Base-T, 100 Base-T), ATM-forum, USB?, FireWire?	Interfaces: Ethernet (10Base-T, 100 Base-T), ATM-forum, USB?, FireWire?
Two wire pairs (preferred)	single wire pair	single wire pair

Key requirements

Data channel only	Telephony & Data combined in the same bitstream	Data channel(s); Lower spectrum inefficiently used for telephony. (splitters!)
medium distance long distance with repeaters (med=3.5 km); (long=6 km)	outperforming ADSL , (due to inband telephony) <ul style="list-style-type: none"> requirement: >4km over 0.5 mm nice to have: >5-6 km over 0.5 mm 	medium distance, at high bitrate
Fixed bitrate, symmetrical	Rate adaptive , at start up <ul style="list-style-type: none"> symmetrical, asym. to enable higher bitrates (3:1) 	Rate adaptive, at start up asymmetrical (about 8:1)
data = 2 Mb/s or N*64 kb/s <ul style="list-style-type: none"> bitrate can be reduced for delivery Nx64 kb/s 	data = 100kb/s .. 1 Mb/s, symmetrical data = 1Mb/s .. 2 Mb/s, asym. (3:1) tel. = inband POTS or ISDN <ul style="list-style-type: none"> lower bitrates are supported in favor of longer range asymmetrical is required only if it improves the max range above 1 Mb/s 	data = 2Mb .. 8 Mb/s tel = "ADSL over POTS", or tel = "ADSL over ISDN" <ul style="list-style-type: none"> lower bitrates are supported in favor of longer range
quality <ul style="list-style-type: none"> jitter & wander requirements 	medium/low priced (close to ADSL in high volumes)	low price

The key requirements in short

- SOHO/consumer market, and therefore telephony support (closer to ADSL than HDSL)
- Inband telephony channel, to outperform ADSL (especially ADSL over ISDN)
- Data channel: 100kb/s - 1 Mb/s symmetrical; 1Mb/s - 2Mb/s asymmetrical (3:1) if it improves
- commonly accepted requirements such as:
 - coexistent with existing ADSL, HDSL and ISDN signals in the same cable
 - interoperable
 - costs comparable with ADSL, when SDSL is deployed in large volumes

Motivation in short on inband telephony

- The reduced performance of "ADSL over ISDN" (we expect up to 30% in range) makes that a significant segment of the market cannot be served by "ADSL over ISDN".
- SDSL must outperform ADSL significantly in terms of bitrate or range under equivalent noise conditions. If SDSL has to rely on splitter technology, it will encounter the same upper limits as ADSL over ISDN currently does.
- If SDSL does not support Telephony (but data only), it becomes a product that mainly serves medium and enterprise business. That kind of services usually require additional demands, such as N×64 kb data transport, G.703 interfacing, low jitter and wander. This is not our main interest, because it would make SDSL a clone of HDSL. KPN prefers to have HDSL updated if HDSL is not fully adequate for this kind of data-only applications.

Motivation in short on bitrates

- SDSL must have sufficient upstream capacity. Therefore, symmetrical is preferred for the 'lower' bitrates (<1 Mb/s).
- SDSL must also have a mode that enables the transport of 2Mb/s video signals. Therefore asymmetrical becomes an option above 1 Mb/s if it improves the maximum range. To enable video conferencing, even in the asymmetric mode, the asymmetry must not exceed about 3:1.
- The lower bitrates are required to enable even reduced broadband services on top of telephony services, under high noise conditions. High noise means about 10 dB more than specified in the KPN proposal on SDSL performance tests (TD27, Vienna, ETSI-TM6, sept 1998).

3. Nice to have features

The 'nice to have' features below are required only if they do not deteriorate the key-requirements, nor increases the time to market or price per link.

- Bitrates such as N×64 kb data transport, G.703 interfacing, low jitter and wander, are no more than "nice-to-have" features because HDSL (or an updated version) can handle this adequately.
- A true lifeline function (POTS or ISDN) via remote powering (in stead of semi lifeline by battery) is a probably a 'nice to have' feature. If the feature of remote powering reduces the maximum range or bitrate, battery powering for telephony is probably adequate. If a service with true lifeline function + broadband data + telephony have to be offered, it can be offered by a second wire pair that carries standard POTS or ISDN systems. Input from manufacturers on the technical consequences on not requiring a true life function is essential for this discussion.
- Single latency (delay < 1.25 ms) is a "nice to have" feature but a dual latency solution (e.g. 20 ms delay for the high latency channel) will probably improve the performance of SDSL data transport. The data channel must have access to the (low bitrate) low-latency channel (see figure on next page) to enable interactive services with voice.
- To improve the bitrate of the data transport on long distances (< 300 kb/s) its nice to have the feature that the data channel uses the capacity of the telephony channel, during the moments that no telephony signals are to be transported.
- SDSL repeaters are not required but nice to have.

4. Reference model

SDSL shall transport telephony and data signals simultaneously. If dual latency is used, the broadband data channel must have access to the small-band low-latency channel. A possible reference model is shown below.

