
TITLE **Spectral Management approach in the Netherlands**

PROJECTS Spectral Management, part 3

SOURCE: SOO, TNO Telecom
Supported by: BBNed (Gerard Goorden), Colt (René van Nieuwenhuizen), KPN (Bob Hoefnagel, Martin Klarenbeek), MCI (Martien de Ridder), Versatel (Abdul Asserti).

AUTHORS*:* Rob van den Brink (TNO Telecom)
Bob Hoefnagel (KPN)

CONTACT: Rob F. M. van den Brink,
TNO Telecom
~~P.O. Box 421~~
~~2260 AK Leidschendam~~
PO Box 5050
2600 GB Delft
The Netherlands

tel ~~+31 70 4462389~~ +31.15.2857059
fax: ~~+31 70 4463166~~ +31.15.2857354
e-mail: R.F.M.vandenBrink@telecom.tno.nl

the above numbers and e-mail address are changed since 1 January 2003, and changed again since 21 nov 2003.

STATUS for Decision

ABSTRACT The Dutch approach of organizing Spectral Management has been summarized by the text in this contribution. It is a multi-operator contribution, all being active in the Netherlands with operating xDSL systems, and all organized within the SOO (a Dutch consultative body). The text in this contribution is proposed to be included as informative annex to the SpM-standard part 3.

---

1. Introduction

Spectral management (SpM) of copper access networks is an essential aspect of maximizing the use of existing copper lines for delivering broadband services. The preferred approach is subject of many studies, the resulting approach is country specific, and views may change when knowledge has increased.
The observation that each country has chosen to use a somewhat different SpM-approach is caused by significant technical differences between European access networks. They differ in many aspects, including: the deployed mixture of legacy systems, the installed cable types, number of wire-pairs per cable, the distinction between multiple binder groups per cable and/or concentric layered cables, the average length of these cables, etc.
Proper spectrum management was in the past a natural activity of incumbent operators, but the introduction of unbundled loops has emphasized the need for organizing it in a more formal way among competitive operators.

In this contribution, the Dutch approach is explained, and has been developed over several years. One mayor aspect of it is that a Dutch consultative body is making the policy around proper Spectral Management, and not the loop provider alone. This so called SOO (In Dutch: *Spectraal Overleg Orgaan*) is a permanent technical body, where loop provider and competitive network operators in the Netherlands meet each other every two weeks (on average). Both the incumbent and other licensed operators see it as their *common* responsibility to maximize the exploitation of available copper resources.

This contribution contains a literal text proposal, for inclusion in the Spectral Management standard part 3 as informative annex. The authors would like to encourage operators in other countries to summarize their SpM approach as well, for additional inclusion.

2. Literal text proposal

The text below proposes literal text for inclusion in informative annex A of the Spectral Management draft, part 3

Annex A. (Informative)
Examples of spectral management in various countries

A.1 Spectral management in the Netherlands

A.1.1 Involved documents (as per 2004)

Various documents can be found on www.kpn-wholesale.com. The most relevant documents, from a spectral management point of view, are:

- Reference offer Unbundling Local Loop (ULL):
  - *[NL1] 01-04-2003 Technical Manual*
  - *[NL2] 01-04-2003 Spectral Management Manual*
- Reference offer Sub Loop Unbundling (SLU)
  - *[NL3] 17-06-2002 SLU Technical Manual*
  - *[NL4] 17-06-2002 SLU Spectral Management Manual*

Other relevant documents are under preparation.

A.1.2 Involved bodies, and their roles

Owner. The incumbent operator KPN owns the local loop wiring in the Netherlands based on twisted pair cables.

Loop provider. A specific unit within KPN facilitates access to the local loop wiring. The loop provider has initiated the current version of the cable management plan, summarized in [NL1-4]. These documents specify the mandatory access rules.

Network Operators. Only market parties (including the incumbent operator KPN), who have signed an "MDF-access"-agreement with the loop provider about using the local loop wiring (procedures, rules, tariffs, etc), may act as network operator. By signing this contract, a network operator agrees to act conform the *access rules* [NL1-4] and to cooperate with procedures [NL1,NL4] like *emergency shut-off*, testing, etc.

Policy maker. The SOO ("Spectraal Overleg Orgaan") is a permanent body of loop provider and interested network operators. This body is the first place of finding agreements among participants in changing the access rules of the current cable management plan. The objectives of the SOO is to enable a more efficient use of available copper resources, because cable management is seen as a common responsibility of all network operators as well as the loop provider.
Another objective of the SOO is to gain more insight in the spectral consequences of broadband usage of local loop wiring. This is seen as the only way to guarantee that the cable management plan is well founded, sensible, understandable and transparent, and that cable management decisions are taken in the knowledge of their technical consequences.

Spectral Policing Unit. The STO ("Spectraal Toezicht Orgaan") is an operational unit, with a spectral policing function, to ensure network integrity. This policing function is pro-active (checks at random) as well as re-active (checks on demand).
It is the mandate of this unit to verify if signal levels at the access ports are not violating the limits of the access rules. Another mandate is to facilitate an *emergency shut-off*, as specified in [NL2,NL4], in case predefined deployed systems deteriorates below predefined performance levels under predefined conditions. The associated criteria are subject for further study, and are to be well specified.
In case of an emergency shut-off, systems attached to other wire pairs will be disconnected according to the "last-in, first out" principle, even when their signals comply with the access rules. The SOO will decide how to proceed after such a shut-off.

Arbitrer. The SAC ("Spectraal Advies Commissie") is an independent advisory body, consisting of three individuals, appointed by the SOO. The SAC members are not employed by any of the network operators, nor by the loop provider. The objective of the SAC is to advise the SOO, in case proposed changes of access rules cannot be agreed within the SOO. This advise is not a binding advise, but acts as a first escalation step in achieving spectral management agreements.

Regulator. The OPTA ("Onafhankelijke Post en Telecommunicatie Authoriteit") is a governmental authority, founded by law, for supervising the unbundling of metallic loops. The current practice is that OPTA is not involved in making any policy about setting and improving access rules. They have chosen to play a reactive role in this. The OPTA serves as a second escalation step in achieving spectral management agreements. (www.opta.nl)

A.1.3 Access rules in the cable management plan (as per 2004)

The access rules [NL1-4] are constructed by combining the following three SpM principles:

(a) The ***multi spectra*** principle, as identified in clause 4.2.1. The descriptions of permitted signals are copied from ETSI TR 101 830-1 into a dedicated document [NL1], containing the signal descriptions summarized below:

- *POTS Transmission Line (PTL) services:*
  - "**POTS**" signals, as defined in ETSI TR 101 830-1
- *ISDN Transmission Line (ITL) services:*
  - "**ISDN.2B1Q**" signals, as defined in ETSI TR 101 830-1
- *HDSL Transmission Line (HTL) services:*
  - "**HDSL.CAP/2**" signals, as defined in ETSI TR 101 830-1
- *ADSL Transmission Line (ATL) services:*
  - "**ADSL over POTS**" signals, as defined in ETSI TR 101 830-1
  - "**ADSL over ISDN**" signals, as defined in ETSI TR 101 830-1
  - "**ADSL.FDD over POTS**" signals, as defined in ETSI TR 101 830-1
  - "**ADSL.FDD over ISDN**" signals, as defined in ETSI TR 101 830-1
- *SDSL Transmission Line (STL) services:*
  - "**SDSL**" signals, for all bit rates, as defined in ETSI TR 101 830-1

Signals that do not fully comply with one of the signal characteristics of this list, are not allowed to be injected into the local loop wiring.

(b) The ***cable-fill*** principle, as identified in clause 4.2.2. Currently, a cable-fill of 100% is allowed, however restrictions on cable fill are subject for further study within the SOO.

(c) The ***cable-length*** principle, as identified in clause 4.2.3. Length dependent limitations are subject for further study, but have not been imposed yet.

A.1.4 Approach of updating access rules (as per 2004)

New developments or improved understanding may give reason to allow injection of signals, which are currently excluded by the access rules. Any proposal for updating any access rule is to be preceded by a dedicated SpM study, for scenarios that are seen as relevant for the Dutch access network. Such a study has to show (a) the expected disturbance to existing systems, and (b) the expected advantage that can be gained from changing the rules.

Reference methodology

The reference methodology is an approach to perform the above-mentioned study, and is mainly based on theory. In that approach is the performance of various xDSL systems predicted by means of computer simulations, for scenarios that are representative for the Netherlands. The computer models for modem performance are all being benchmarked against performance requirements from standards or measurements, and this ensures fair assumptions. The objective is to make a transparent separation between technical-oriented observations and business-oriented decisions, to classify xDSL systems on the results of these simulations, and to decide on access rules in the knowledge of their technical consequences.

The reference methodology starts with performance calculations, that hold under a so-called "reference scenario". Such a scenario is constructed from two parts:

- The *reference conditions*, being a best-effort estimate on the characteristics of Dutch cables and available xDSL modems. The conditions enable the estimation of the 99% worst-case cross talk noise in victim wire pairs, and the sensitivity of modem performance to this noise. The simulation models follow ETSI TR 101 830-2 as close as possible, and the associated parameter values are well specified.

- The *reference technology mixture*, being a best estimate from Dutch operators in the SOO on the number and type of xDSL systems that may be deployed in the future. The mix is summarized in table 1, and covers such a high number of modems because it is assumed that xDSL will become an enormous commercial success. Nevertheless, the mix is less then 28% broadband cable-fill on average, since Dutch distribution cables are often constructed from 900 wire-pairs. This reference mix may change in future when market views have improved.

Next, the reference methodology compares these *reference* results with *alternative* results, obtained from calculations under the same reference conditions but with alternative technology mixtures. The change in observed performance is then indicative for the impact of such a change, and quantifies how significant (or insignificant) this impact will be. Changing the mix by replacing a part of the legacy systems by future systems is such an alteration.
The observed change enables a classification of systems into less and more disturbing ones, under the Dutch reference conditions. The results are being used for more business-oriented decisions, dedicated to keep or change the current access rules.

These reference studies are an ongoing activity in the Netherlands, and this may proceed as long as new xDSL systems are being introduced. Many details of this methodology are still (2004) subject for further study, and it is the intention of the SOO to have the reference scenario and the relevant studies well documented, and to evolve the reference methodology into a mandatory approach.

	Usable ranges	***REF Short range***	***REF Medium range***	***REF Long range***
ADSL.EC/POTS	*All ranges*	63	63	63
ADSL.FDD/POTS	*All ranges*	96	96	96
ADSL.EC/ISDN	*All ranges*	21	21	21
ADSL.FDD/ISDN	*All ranges*	32	32	32
SDSL 512	*All ranges*	–	–	38
SDSL 1024	*Short & medium*	16	32	–
SDSL 2048	*Short only*	8	–	–
SDSL 2304	*Short only*	8	–	–
HDSL.CAP/2	*Short & medium*	2x3	2x3	–
Total broadband		**250**	**250**	**250**
ISDN		150	150	150
Total narrowband	*All ranges*	**150**	**150**	**150**

Table 1*: Dutch reference technology mix for local loop unbundling.*

The reference mix in table 1 is a pragmatic mix, that is a compromise between realistic and simple. To keep it realistic, the mix changes with the length of the loops since the highest bit-rates will fail on the longest loops, and this makes it unlikely that they will be deployed on long loops.
To keep it simple only three (overlapping) ranges have been identified: "short", "medium" and "long". The distinctions between these ranges are pragmatic too, and subject for further study. The boundaries of the ranges may change per study, if considered as relevant for that study. As a rule of thump: short loops are below 2800m, medium loops are between 2200m and 5000m, and long loops are above 4500m.

Capacity forecast
The SOO is gaining more technical knowledge about the possibilities of using the copper lines for xDSL deployment, by studying the decrease in performance of operational systems when the number of deployed systems increases with the time. The objective is to forecast possible problems and to take proper measures. Several participants of the SOO are exchanging performance information, reported by the management system of their xDSL modems. This activity ("spectral thermometer") is a result of taking common responsibility for maximizing the usage of available copper resources,

A.1.5 Approach of identifying performance problems (as per 2004)
The SOO is developing a procedure, which gives guidance to identifying the real cause of observed performance degradation. The objective is to distinct between violation of access rules, mal-functioning deployment practices, cables with poor broadband characteristics (loss, cross talk coupling, length), or fundamental spectral compatibility issues.

Emergency Shut Off (ESO) Process
The ESO process is used to manage and prioritize the availability of services deployed on Access Lines once spectral disruption has been identified. The loop provider will undertake the ESO process whenever the failure rate of existing or mandatory 2Mb/s leased lines of network operators have increased to unacceptable levels due to spectral disruption. Part of the process is placing filters, starting with the last broadband system that was added to the cable, and this is continued until the spectral disruption has disappeared. The cable will then be closed for additional broadband systems.

A.2 Spectral management in <some other country>
<for further study>

End of literal text proposal

3. Conclusion
This contribution proposes literal text for an informative annex to the Spectral Management standard, part 3. It describes the way SpM is organized in the Netherlands, in the year 2004. We would like to encourage operators of other countries to do the same, and provide ETSI-TM6 with similar text that is valid for their country.