# Digital Private Network Signalling System

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The **Digital Private Network Signalling System** (**DPNSS**) is a network protocol used on digital trunk lines for connecting two PABX. It supports a defined set of inter-networking facilities.

DPNSS was originally defined by British Telecom. The specification for the protocol is defined in BTNR188. The specification currently comes under the Network Interoperability Consultative Committee.

## Contents



## History

DPNSS was developed in the early 1980s by BT, or its forerunner, Post Office Telecommunications in recognition that the emerging Digital Private Circuit Primary Rate product 'Megastream' had to address the market for both data and Voice. The latter being significantly greater because of the market for PBXs. It may seem odd now that BT would invest in the development of a signaling protocol for PBXs in which it had a minority interest and in competition with its PSTN services. Under the liberalization rules of the day, (1979) BT was barred from manufacturing, selling or supplying PBXs of more than 200 extensions. Digital (PCM based) PBXs were just starting to come into the marketplace with the ROLM/Northern Telecom SL1, and Plessey PDX, it was recognised that corporate customers would wish to network these systems across the country. At the time 'CAS' inter node signaling was slow and inter-register signaling MF5, developed for the PSTN was complex and would not support sufficient features. The support for DPNSS as BT's own signaling protocol also differentiated BT's private circuit’s services from those of its emerging rival Mercury Communications. In practice, DPNSS was possibly a backroom development by a couple of guys at BT's research labs whose efforts accidentally found a market and official support. BT and some of the UK manufacturers championed DPNSS into ECMA and CCITT (ITU) but it was eventually deprecated by the standards bodies in favour of Q931 and QSig. Nevertheless, the elegance of the protocol and it's compatibility with PBX features ensured the adoption DPNSS actually grew in Europe, compared to the much slower take-up of Qsig. Version 1 of BTNR188 (DPNSS) was issued in 1983, the last version of DPNSS to be released 6 in 1995 included compatibility with ISDN features released in V5. A lightweight version of DPNSS 'APNSS' was developed for smaller PBXs.

## Overview of the Protocol

Layer 1(CCITT) ITU-G703 defines the physical and electrical interface. G704 defines the Frame structure of the 2.048 Mbs sent across the link. G732 defines the allocation of that frame structure into the 32 discrete 64Kbit 'channels', of which 0 is used for alignment of the frames and 16 is (by convention only) allocated to common channel signaling. Speech is carried as G711. Layer 2 Timeslot 16, 64Kbs operates as HDLC LAPB, to support up to 60 PVCs or DLCs (data link connections) as the specification describes them. Therefore, at maximum operation, each potential traffic channel can have two simultaneous data channels available for messages. Note that HDLC operates as a statistical multiplexing system. When traffic delta's are low, a single call establishment message will have access to the full 64Kbs (allowing for overheads. DPNSS is a layer 3 protocol functioning as common channel signaling. The functionality is divided into Levels (confusingly nothing to do with OSI layers.) Levels 1-6 deal with simple call establishment (make call/break call) and are the minimum requirements by which a PBX can be said to be DPNSS compatible. The remaining levels are allocated to telephony features, supplementary services, or to administrative features. Note that support of 'levels' by a PBX is not necessarily incremental. Some levels are interdependent but a PBX may omit support of some levels (above 6,) and support others. DPNSS is a compelled protocol in that each instruction issued must be met with an appropriate response from the other PBX otherwise the message is re-

transmitted (until timer expiry). This means that when interworking two PBXs features invoked on PBX A must be acknowledged by PBX B even if that feature is not supported. DPNSS carries its protocol messages as short strings of IA5 text. It is therefore much easier to interpret in its native form than Q931/Qsig or H323/H450, and a pre-cursor to the plain language format of SIP.

## Practical Considerations

As HDLC can operate successfully in quite poor (errored) data environments, DPNSS will work over a 2Mbs link running without proper synchonisation (plesiochronously) and over poor quality connections (including badly terminated connectors). When setting up PBXs to run a DPNSS connection one end must be defined as the primary or 'A' end. This is a protocol requirement and has nothing to do with link synchronisation.

## DPNSS and VoIP

For a protocol that began life in the 1980s, DPNSS is natively a long way from VoIP. However many of the hybrid VoIP PBXs available from manufacturer's world wide, provide on-board DPNSS trunk cards. Where they do not, a Protocol converter is necessary. Commercially available equipment offers the ability to convert from DPNSS to Q.Sig . Note that It is also possible to tunnel DPNSS and it's associated PCM (G711) over an IP network. This can be point to point where the IP network carries packetised voice N x 64Kbs speech and a separate IP signalling channel to carry the notional 64Kbs of DPNSS signalling. A more sophisticated solution uses intelligence on the edge of the IP network to route voice to the correct node. This is a [VoIP (voice)VPN (http://en.wikipedia.org/wiki/Voice_VPN)] Note that this should not be confused with the pre voip 'Voice VPN' deployed by routing calls intelligently in a TDM switching platform, often Nortel DMS100 and customers PBX nodes.

## Criticisms

Some critics of DPNSS suggest that it is too loosely defined and allows too much latitude in its interpretation of message formats and timers. It is also sometimes mistakenly believed that DPNSS is semi proprietary and that it is only possible to connect PBXs from the same manufacturer. i.e. Siemens will connect to Siemens, Mitel to Mitel etc. Experience indicates that this is not the case and BT's FeatureNet platform (Nortel's DMS100) running DPNSS, has interconnected successfully to many PBX types available in the UK.

## See also

- DASS1 (obsolete)
- Digital Access Signaling System 2 (DASS2) (obsolescent)
- QSIG (the ISO equivalent of DPNSS, uses the Q.931 and ROSE protocols. It is widely used in the rest of Europe).

## External links

- The DPNSS specification at NICC (http://www.nicc.org.uk/nicc-public/Public/interconnectstandards/dpnss/nd1301_2004_11.pdf)