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PABX INTERCONNECTION OVER ATM AND DQDB

# VOICE INTEGRATION BETWEEN THE MAN AND THE ATM WAN INFRASTRUCTURE

The objective of the PABX interconnection over two different network technologies (DQDB and ATM) is to evaluate the feasibility of the seamless voice integration between the MAN and the ATM WAN infrastructure.

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The integration of the voice over ATM and DQDB means to provide:
- end-to-end reliable transport mechanism and also synchronization for the 2-Mbps bidirectional constant bit rate data stream generated from the PABXs that manage the single phone calls
- a common communication protocol between the two PABXs connected to the MAN and the ATM network that operates transparently to the network technologies (Q-Sig, Euro-ISDN protocol)

## Voice transport and synchronization

### Transport over ATM

The constant bit rate (CBR) stream from a PABX through a 2-Mbps TDM E1 interface in the ATM service multiplexer, that implements an ATM Adaptation Layer AAL1 is segmented into cells and transmitted into the ATM network with timing information about the source clock for the common synchronization PABX to PABX.

Currently two clock synchronization methods are defined:
- the SRTS (synchronous residual time stamp) method [1], which allows to synchronize a service clock between sender and receiver based on a network clock that is common to both sides
- the adaptive clock mechanism that allows to transmit clocking information transparently and not explicitly from the sender to the receiver. In this case, the receiving E1 card runs its own transmission clock and tries to keep the fill level of the ATM cell reception buffer at an average value by adapting the speed of this clock.

Actually, most of the ATM service multiplexer (ATM SMUX) E1 interfaces do not support the SRTS method and implement only the adaptive clock mechanism.
Taking into account the previous consideration, the general concept to maintain a common clock between

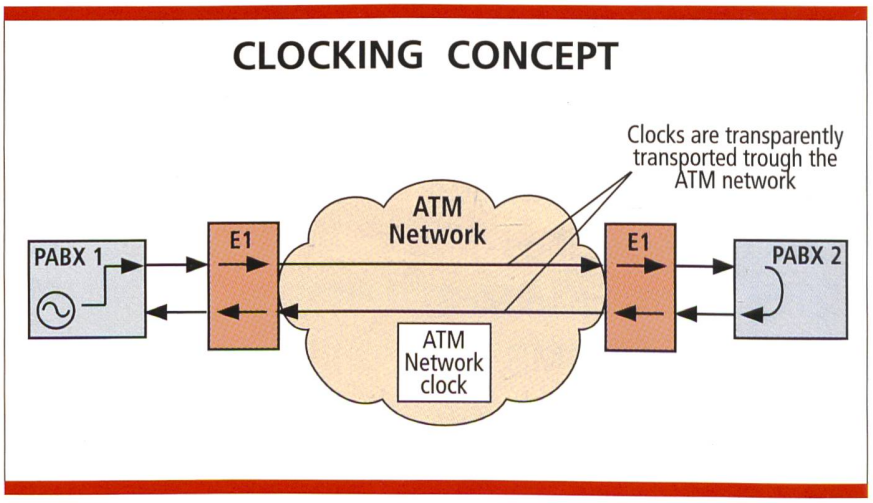


Fig. 1. Plesiochronous clocking concept with master-slave PABXs.

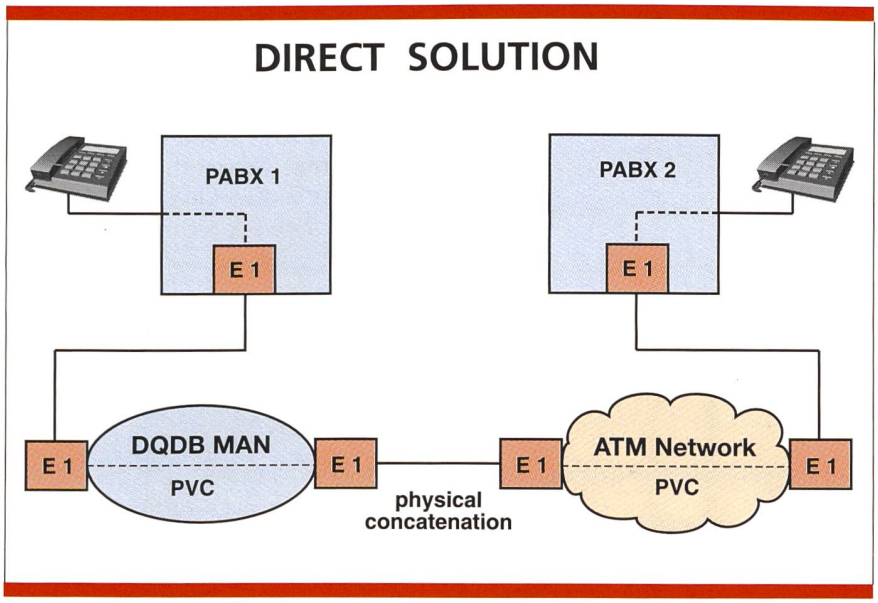


Fig. 2. MAN/ATM: direct solution.

two ATM SMUX E1 interfaces linked via an ATM WAN and also between an E1 interface and the connected PABX can be formalized as follows.
One PABX acts as the clock master *(Fig. 1)*, and the E1 card connected to it passes the clock transparently through the ATM network with the adaptive clock method recovered by the other E1 card and used to synchronize the link to the second PABX. This second PABX

- acts as a clock slave and transmits with the clock of the received signal
- may have its own transmission clock

The backwards link is then clocked in analogy to the forward link.
It should be noted that actually the ATM technology (PVC) transports the entire 2-Mbps CBR stream and does not support fractional E1 single-channel switching approach, more interesting and optimized for the bandwidth.

### Transport over DQDB

The MAN DQDB transparently transports the 2-Mpbs CBR data stream generated from the PABX. The clocking for the entire network is provided externally on a source clock that can act as a reference clock also for the master PABX.

## Interworking ATM/DQDB

If two PABXs can be connected via an ATM WAN network and also through a MAN DQDB, the next logical step is the interconnection of the two PABXs over ATM and DQDB.

### Direct solution

A first and more intuitive approach to guarantee this network interworking is to set up an independent E1-to-E1 logical connection (PVC) on both the MAN and the ATM networks and a direct concatenation of one E1 interface on the ATM with one on the DQDB, so that both are viewing each other as the PABX *(Fig. 2)*.
The clocking concept for this interworking configuration can be presented as a combination of the ATM and the MAN-DQDB concept.
We connect the DQDB to the master PABX and the ATM to the slave *(Fig. 3)*.
The MAN requires a stable clock source. If the input signal is used for this, the master side guarantees an original signal with minimum jitter. If an external source is used, it can also be used as a clock reference for the local PABX.
Practical experiences demonstrate that there is no change if the master PABX and the DQDB have the same clock reference or if the master PABX's E1 signal serves as clock reference for the MAN.

### Gateway solution

A second, more realistic and less complex approach is the use of a gateway PABX that controls the access to each of the two networks: MAN and ATM and allows to set up any desired connection on the PABX level *(Fig. 4)*.
The solution avoids to create a direct physical link through the MAN and the ATM. This means that the problem of passing from one network to the other is completely shifted from a network interworking to PABX switching.

## Conclusion

Voice CBR E1 services on ATM and on DQDB are transparent to each other

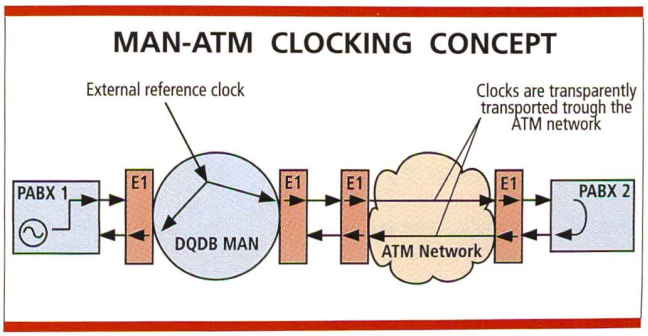


Fig. 3. MAN-ATM clocking concept.

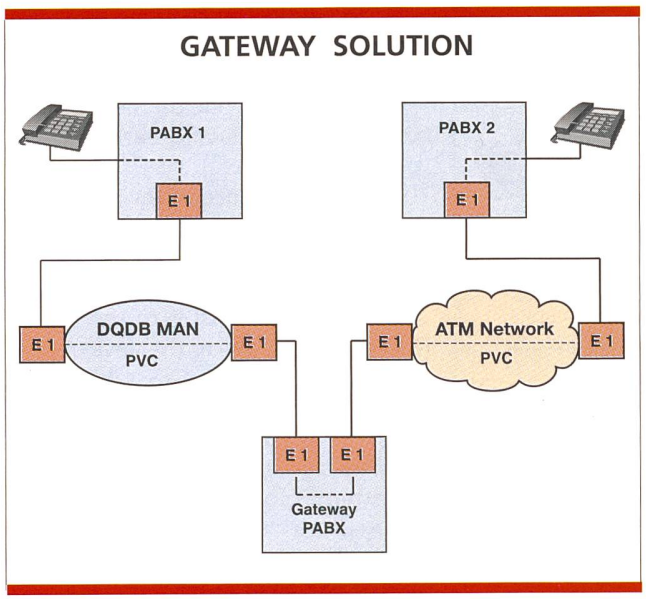


Fig. 4. MAN/ATM: gateway solution.

and could therefore be combined easily to offer a seamless voice integration. The more realistic solution for a PABX interconnection realization over DQDB and ATM is the gateway PABX solution that reduces the problem to a pure PABX networking, independent from the network technologies. [9.4]

## References

[1] I-ETS 300 353 B-ISDN ATM Adaptation Layer (AAL), specification-type 1

## ZUSAMMENFASSUNG

### TVA-Durchschaltung via ATM und DQDB

Das Ziel der TVA-Durchschaltung über zwei verschiedene Netztechnologien (DQDB und ATM) liegt darin, die Möglichkeit der nahtlosen Sprachintegration zwischen der MAN- und der ATM-WAN-Infrastruktur abzuklären. Die Sprachintegration über ATM und DQDB erfordert: Bereitstellung zuverlässiger Ende-zu-Ende-Transportmechanismen und Synchronisierung für den bidirektionalen 2 Mbps Datenstrom mit konstanter Bitrate von den Teilnehmervermittlungsanlagen, welche die einzelnen Telefonanrufe abwickeln. Ein gemeinsames Kommunikationsprotokoll zwischen den beiden TV As verbindet die eine mit dem MAN- und die andere mit dem ATM-Netz welches gegenüber den Netztechnologien transparent arbeitet (Q-Sig, Euro-ISDN-Protokoll).

**Diego Diviani,** grad. from the Swiss Federal Institute of Technology (ETH), started working for the Swiss Telecom PTT R&D in 1991. He participeted at the service concept definition and evaluation of the SwissMAN-DQDB. He was involved with consulting and enginering for SwissMAN customer projects (KOMBV1 the most important). Member of the ETSI STC NA5. In 1994/95, he collaborated at the SwissWAN services definition. Actually, he is responsable for the MAN/ATM interworking activities within the Swiss Telecom R&D and also for the broadband network services integration in the private and/or shared network domain.


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