PACKET SWITCHED NETWORKS - THE FUTURE OF DATA-COMMUNICATIONS ?

Joerg Groessler
Joerg Groessler GmbH, Berlin, West Germany

Summary

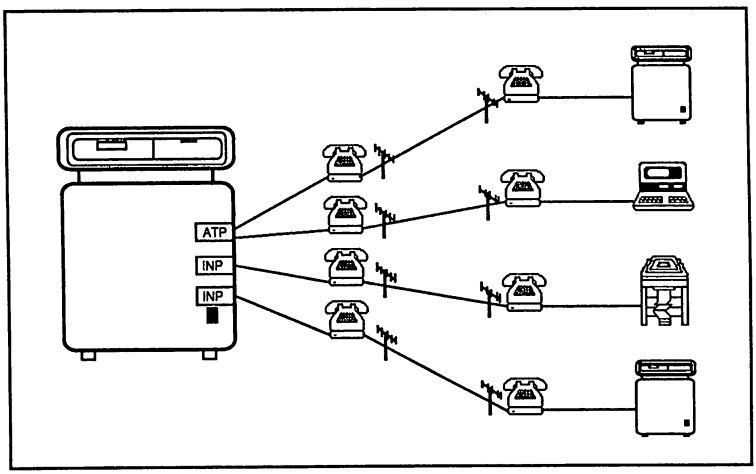
Packet Switched Networks (PSN) provide data communication on the basis of an international standard data communication protocol (X.25). In addition to fail-proof data transfer it offers a method of establishing logical rather than physical connections.

Since PSN has been introduced, efforts have been undertaken to create new standards for all kinds of tasks in data communications (terminal access, file transfer, remote job entry) using X.25 as their basic transportation method. The first result was PAD (packet assembly and disassembly) which meanwhile is supported on all major computer systems worldwide (including HP3000). Other standards are still discussed or in the status of a draft (e.g. file transfer).

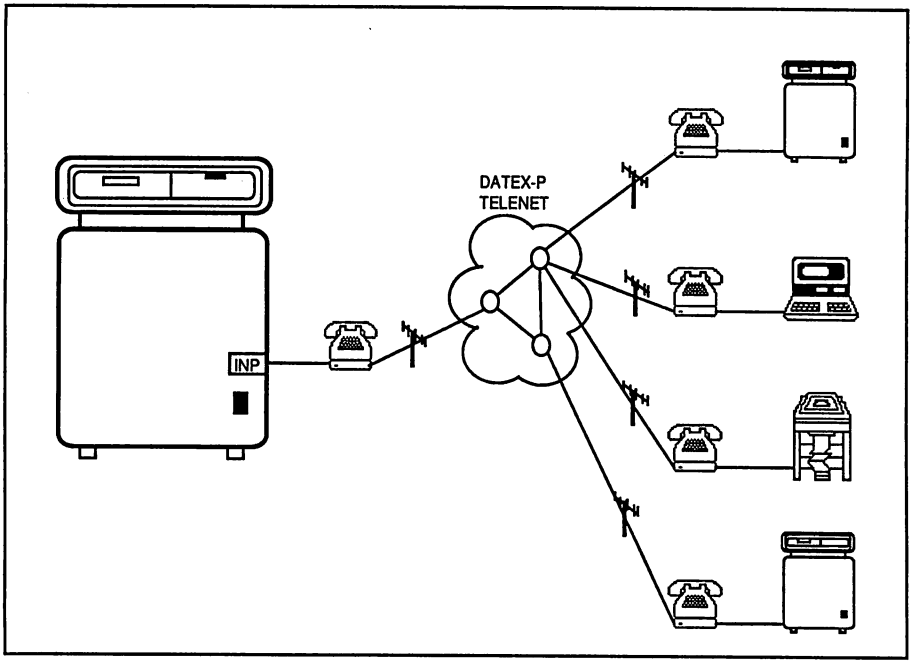
After some time of confusion (basically about handling and pricing) users start to understand that PSN opens them a world where various computer systems made by different vendors can talk to each other on a very high level of communication (something like DS working on all kinds of systems). Big companies solve their problem of communication between different computer systems. Other Companies start to provide services (like database access, electronic mail) which can be used by everybody having PSN access.

1. Basic Structure of PSN

In traditional data communication enviroments, data terminals (which stands for either a real terminal or a host computer) are connected via telephone lines. Modems are required to transform the digital signals which have a theoretically unlimited bandwidth to analog signals with the bandwidth of a telephone line which is app. 3 Khz. Connections are done either by simply dialing (using a handset) or by establishing a permanent connection (leased line).

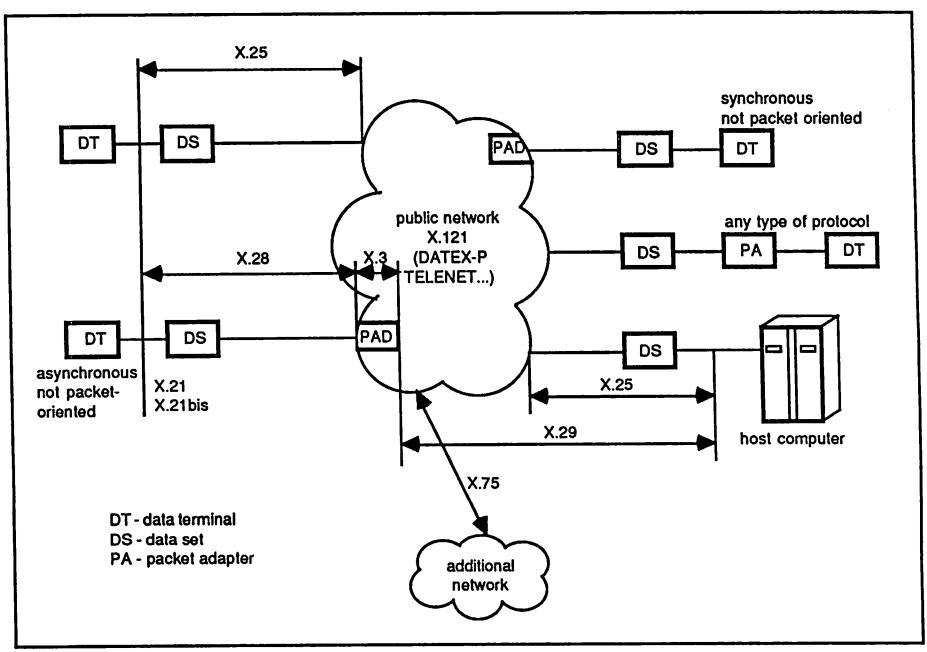


In Packet Switched Networks computers take care of establishing a connection between one data terminal and another. The data terminal is connected via a modem to the exchange computer (mostly using leased lines). Data is transmitted no longer in a steady flow but in portions of so called packets. Each packet is provided with an address, which makes it possible to have more than one logical connection open at a time (using the address in the packet the exchange computer knows which logical connection part of the data belongs to).

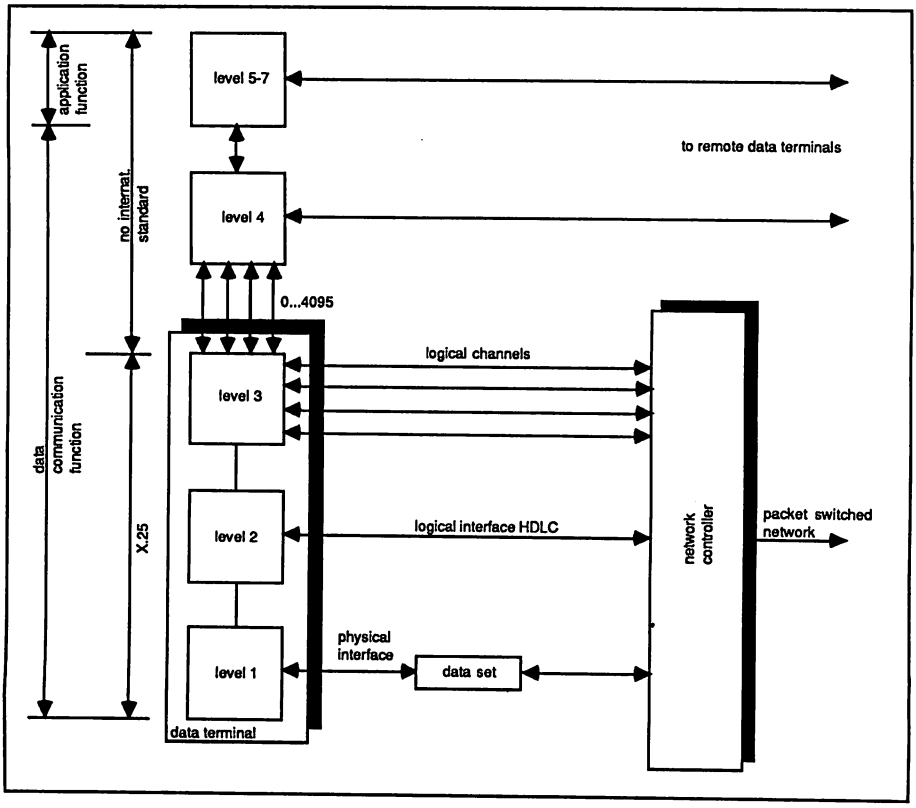


2. Standards involved in Packet Switched Networks:

X.3	Packet Assembly and Disassembly Unit (PAD) which is used in a PSN enviroment for an asynchronous data terminal. A virtual terminal which can be controlled (speed, XON/XOFF, echo etc.) by standard functions (e.g. escape sequences) regardless to what host computer it is connected.
X.21	Interface between data terminals and data communication units (modems) for synchronous transmission within public networks.
X.21 bis	as X.21 but using the V-Series of modems (e.g. V.22)
X.25	Interface between data terminals and data communication unit for terminals using packet switched networks.
X.28	Interface between a data terminal and a data communication unit for an asynchronous terminal using a PAD unit to access the packet switched network within the same country. This standard can also be applied to local PAD units which may be a program in a mainframe or a PC.
X.29	Method of exchange of data and control information between a PAD unit and a data terminal working in packet mode (which typically is the host computer).
X.75	Communications interface between different packet switched networks.
X.121	International numbering scheme for public packet switched networks.

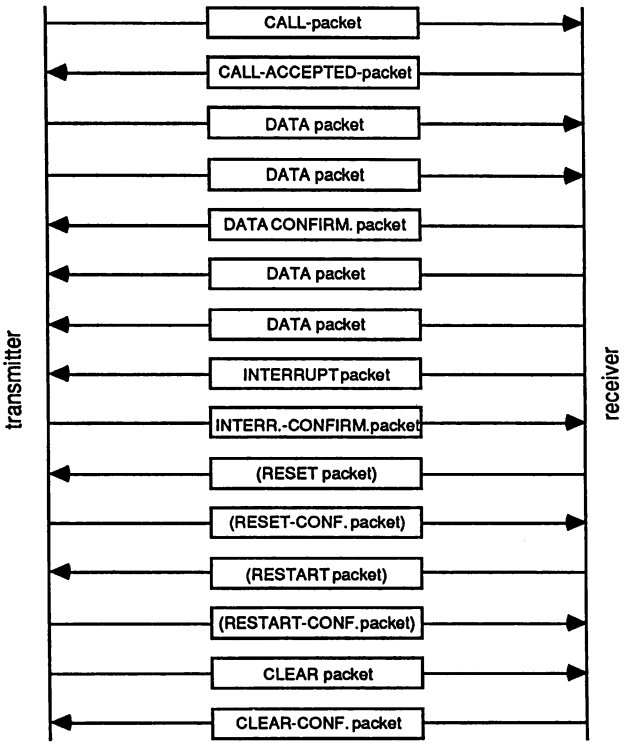


3. X.25 Characteristics

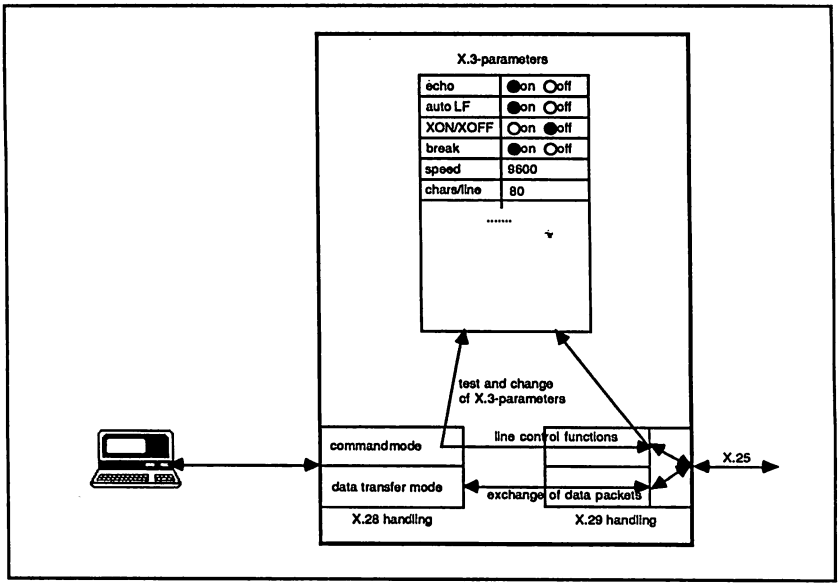


These are the main characteristics for packet switched networks:

- Automatic dialing with various options (collect call, "closed user group" (access only possible for a certain class of users), "call user datafield" (additional information about the kind of connection)
- error proof data transfer using HDLC protocol on level 2
- flow control on level 3 (packet level)
- interrupt as a bypass in the event of e.g. errornous flow control
- various levels of error handling (soft, hard etc.) using RESTART and RESET packets

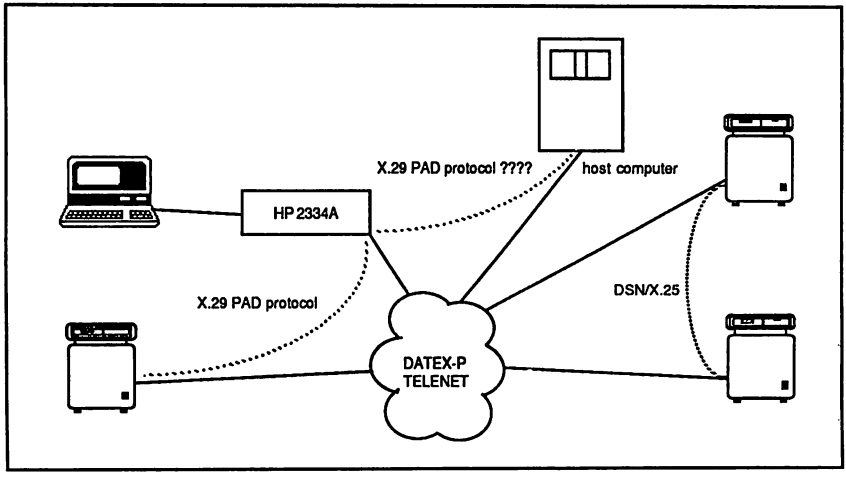


PAD: a standard data terminal; a set of parameters (speed, echo on/off etc) can be tested and manipulated by both end user and host computer. So far this is the only available standard for levels 4 to 7.



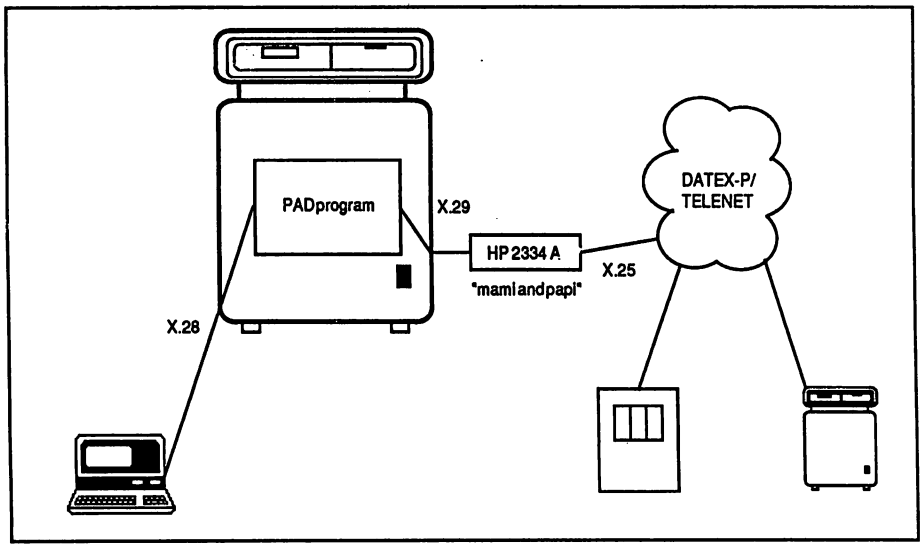
4. HP3000 and PSN

Available for HP3000: DSN/X.25 (using an HP-specific protocol on levels 4 to 7), X.29 PAD protocol which allows to run PAD sessions in MPE

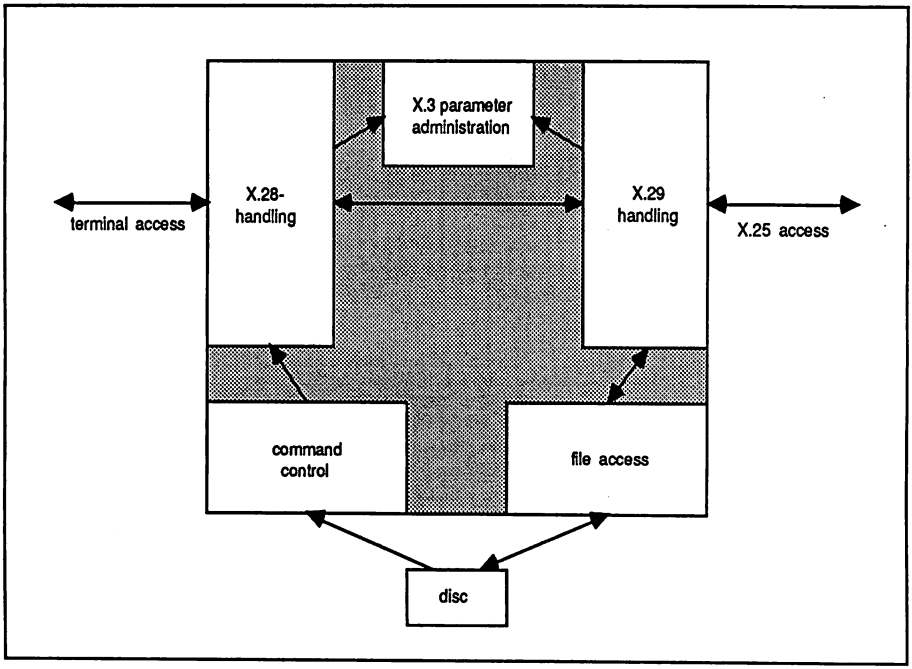


5. Structure of a PAD Program

A PAD program would enable access to any host computers which support the X.29 PAD protocol.



Introducing special stuctures a PAD program could be used for much more than just running a session on a remote computer: As long as there is no international standard for file transfer, PAD could perform this function temporarily. Another interesting feature would be to 'predefine' PAD sessions so that they can be run in a job stream.



Biography

Joerg Groessler is founder and general manager of the Joerg Groessler GmbH company in Berlin, West Germany. Since 1980 he designs and develops software tools for HP3000 and works as a consultant in special technical issues (e.g. systems performance, special capabilities). After having got in touch with an HP computer back in 1971 (HP2114) he now has over 10 years of experience in HP3000 programming.