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SERIES X: DATA NETWORKS AND OPEN SYSTEM
COMMUNICATIONS

Public data networks – Interfaces

**Procedures and methods for accessing a public
data network from a DTE operating under
control of a generalized polling protocol**

ITU-T Recommendation X.42

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ITU-T Recommendation X.42

Procedures and methods for accessing a public data network from a DTE operating under control of a generalized polling protocol

Summary

This Recommendation defines procedures and a framework for providing access to a Public Data Network (PDN) by a DTE operating under the control of a generalized polling protocol, via the use of a Packet Assembly/Disassembly (PAD) device situated within (or associated with) the PDN. The PAD supporting the generalized polling protocol aspect is referred to as a "GPAD". The generalized polling environment provides support for access, along with basic requirements necessary within the PAD to enable the selection and modification of the protocol Aspect. This Recommendation has been developed in realization that a well-established base of DTEs operating under control of a generalized polled protocol needs to access a PDN. Also, procedures are defined that allow Internet Protocol (IP) enabled devices to access their corresponding networks over the generalized polling protocol defined under ITU-T Rec. X.42.

The revision is a result of comments received from implementers. Several clarifications are introduced that remove ambiguities in the areas of bit, field and frame sequencing; event conditions; and checksum algorithms.

Source

ITU-T Recommendation X.42 was approved by ITU-T Study Group 17 (2001-2004) under the ITU-T Recommendation A.8 procedure on 29 October 2003.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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ITU-T Recommendation X.42

Procedures and methods for accessing a public data network from a DTE operating under control of a generalized polling protocol

1 Scope

This Recommendation defines the procedures and methods for accessing a Public Data Network (PDN) from a DTE operating under the control of a generalized polling protocol via the use of a Packet Assembly/Disassembly (PAD) device situated within (or associated with) the PDN.

This Recommendation is the first of a set of Recommendations produced to facilitate asynchronous access to a PDN via Point-to-Multipoint (PMP) circuits. This Recommendation addresses the most important aspect of communications between the PAD and a subnetwork of terminals connected via PMP circuits – the multidrop data link protocol providing medium access arbitration, data link addressing and data protection for transmission over a PMP circuit.

For those terminal devices and PMP environments, which require expanded networking capabilities and which, in addition to PMP medium arbitration, transmission error detection, and station addressing, require transparent transmission of network layer PDUs within user data of X.42 information frames, an encapsulation class of procedures is defined.

In the case of IP-based networks, an X.42 PAD is therefore considered as a network edge device, which provides connectivity between PMP-based, IP-enabled terminals and IP-based devices on the opposite side of the network. There exist large networks of terminals connected to PDNs, characterized by low data throughput requirements both in terms of channel bandwidth and packet per second rate. Such a traffic profile mandates the need for a reduction of cost sensitive network architecture components, which traditionally grow as a function of the number of remote terminals. In a practical sense, this amounts to a requirement for various forms of concentration and clustering of switching equipment, tail circuits, virtual communications channels and trunks, such that the total number does not grow in direct proportion to the number of end users terminals. Major savings in cost and resource utilization can be achieved when effective sharing of data communications channels is applied.

The majority of the networks which utilize PMP technology are implemented using inexpensive analogue circuits and asynchronous data transmission. This configuration is prevalent in many transaction processing applications with request/response type traffic, consisting of a small number of short bidirectional messages.

To be economically viable, applications running over PMP circuits typically require very low unit cost data communications. Such low costs can only be achieved through major economies of scale leading to a lower telecommunications resource usage. These PDN resources, in the case of those complying with ITU-T Rec. X.25, are:

- multidrop ports;
- Telecommunications modems;
- X.25 DTEs, with an efficient concentration ratio of PAD X.25 DTEs to the total number of terminals;
- X.25 SVCs, with an efficient concentration ratio of X.25 SVCs to the total number of terminals;
- Call Establishment Requests, with a low ratio of total number of call requests to the total number of terminals; and
- Non-informational traffic, as the request/response characteristics of the traffic inherently induces piggy-back acknowledgments.

This Recommendation directly addresses these needs by providing simple, low complexity and bandwidth-efficient network resource management. Introduction of this protocol aspect enables a low cost offering, and opens PDN transport to a broad existing terminal base. See Figure 1.

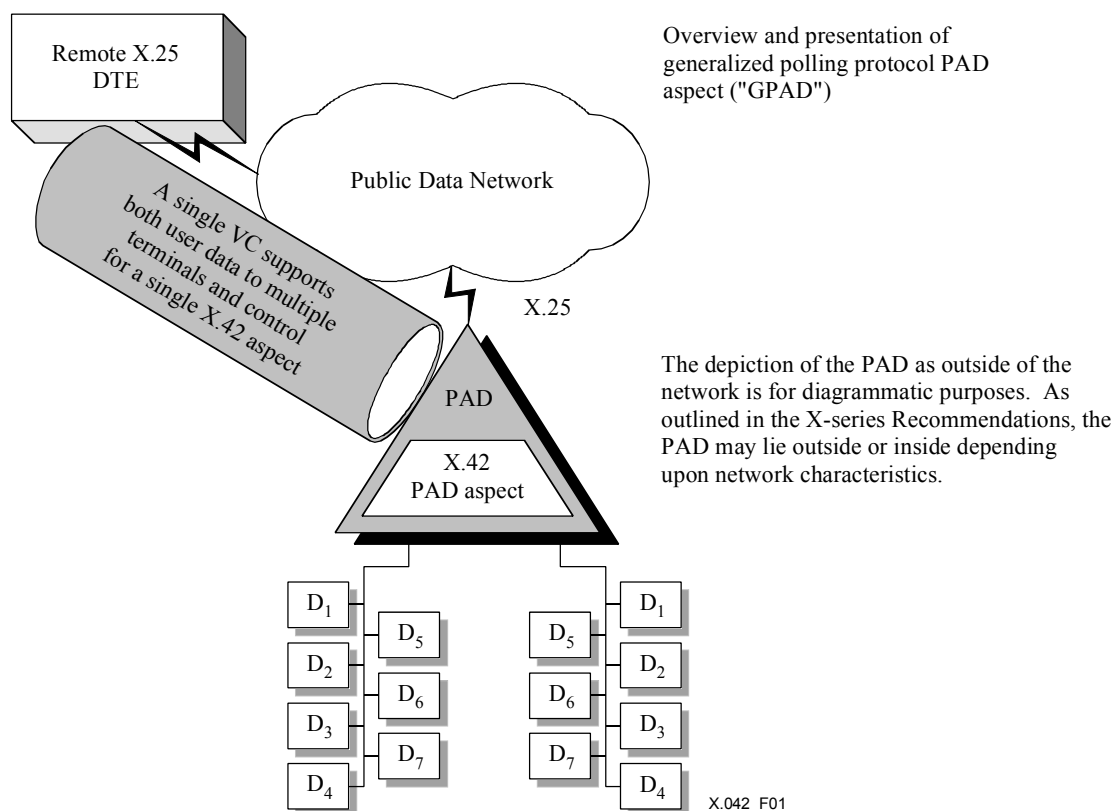


Figure 1/X.42 – GPAD environment

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- ITU-T Recommendation X.3 (2000), *Packet Assembly/Disassembly facility (PAD) in a public data network*.
- ITU-T Recommendation X.5 (1996), *Facsimile Packet Assembly/Disassembly facility (FPAD) in a public data network*.
- ITU-T Recommendation X.8 (1994), *Multi-aspect PAD (MAP) framework and service definition*.
- ITU-T Recommendation X.25 (1996), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit*.
- ITU-T Recommendation X.28 (1997), *DTE/DCE interface for a start-stop mode Data Terminal Equipment accessing the Packet Assembly/Disassembly facility (PAD) in a public data network situated in the same country*.

- ITU-T Recommendation X.29 (1997), *Procedures for the exchange of control information and user data between a Packet Assembly/Disassembly (PAD) facility and a packet mode DTE or another PAD.*
- ITU-T Recommendation X.38 (1996), *G3 facsimile equipment/DCE interface for G3 facsimile equipment accessing the Facsimile Packet Assembly/Disassembly facility (FPAD) in a public data network situated in the same country.*
- ITU-T Recommendation X.39 (1996), *Procedures for the exchange of control information and user data between a Facsimile Packet Assembly/Disassembly (FPAD) facility and a packet mode Data Terminal Equipment (DTE) or another FPAD.*
- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The basic model.*
- ITU-T Recommendation X.213 (2001) | ISO/IEC 8348:2002, *Information technology – Open Systems Interconnection – Network service definition.*
- ITU-T Recommendation X.263 (1998) | ISO/IEC TR 9577:1999, *Information technology – Protocol identification in the Network Layer.*
- ITU-T Recommendation X.340 (1993), *General arrangements for interworking between a Packet-Switched Public Data Network (PSPDN) and the international telex network.*

3 Definitions

This Recommendation defines the following terms:

- 3.1 access information path:** The communication link between a DTE and a GPAD.
- 3.2 access interface:** A physical interface where a DTE is connected to a GPAD to use the functions it provides.
- 3.3 binary numbers:** Base 2 numbers, represented by the digits 0 and 1 followed by the letter "b".
- 3.4 broadcasting:** Global addressing or delivery of messages via the outbound information path, utilizing an address unique from all other addresses assigned to terminals on a particular GPAD port such that it is recognized by all terminals as its own. Broadcasting is always Unsolicited. Broadcasting does not generate any inbound acknowledgment traffic.
- 3.5 byte complement:** Defined by complementing all eight bits of a byte.
- 3.6 drop:** A station/terminal device connected to a PMP circuit operating in secondary mode.
- 3.7 generalized polling protocol packet assembly/disassembly facility:** A facility that provides an access to a Public Data Network for a DTE which operates under control of a generalized polling protocol.
- 3.8 hexadecimal numbers:** Base 16 numbers, represented by the digits 0 to 9 and A to F followed by the letter "h".
- 3.9 host DTE:** The remote DTE that provides the upper layers of applications required to fully utilize the X.42 Generalized polling protocol access to the PDN (GPAD) functionality in specific application environments.
- 3.10 inbound information path:** Data transfer from the terminal to the GPAD.
- 3.11 outbound information path:** Data transfer from the GPAD to the terminal.
- 3.12 PAD aspect:** A term that represents the logical function of a PAD operating with a specific protocol used by the DTE connected to a GPAD.

- 3.13 port:** A representation of the attachment of a PMP circuit to a GPAD instance.
- 3.14 solicited exchange traffic:** Solicited exchange consisting of one inbound (request) and one outbound (response). The terminal sends a request only when it is polled (i.e., unsolicited inbound data transfer is illegal).
- 3.15 traffic:** Any data stream being sent by, or received by a terminal, may be considered as "traffic". Two types of traffic exist: Solicited Exchange Traffic and Unsolicited message Traffic.
- 3.16 unsolicited message/traffic:** Data transfer activity directed outbound to individual terminals, asynchronous with respect to the request/response exchange traffic. Individual unsolicited outbound transfer requires inbound acknowledgements.
- 3.17 upper layer information:** Defined as the actual user information conveyed in the information field of a frame.

4 Abbreviations

This Recommendation uses the following abbreviations:

AIP	Access Information Path
BIF	Broadcast Information Frame
CRC	Cyclic Redundancy Check
CRC-16	16-bit Cyclic Redundancy Check
DCE	Data-terminating Circuit Equipment
DLL	Data Link Layer
DRC	Diagonal Redundancy Check
DTE	Data Terminating Equipment
FCS	Frame Check Sequence
GPAD	Generalized Polling Protocol Accessed Packet Assembly/Disassembly Device
IP	Internet Protocol
ISIF	Inbound Solicited Information Frame
LRC	Longitudinal Redundancy Check
NLPID	Network Layer Protocol Identifier
NUA	Network User Address
OSIF	Outbound Solicited Information Frame
OUIF	Outbound Unsolicited Information Frame
PAD	Packet Assembly/Disassembly facility
PDN	Public Data Network
PDU	Protocol Data Unit
PMP	Point-to-Multipoint
PSDN	Packet Switched Data Network
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

5 GPAD framework

A GPAD provides the means for terminals to access a PDN via multipoint circuits. A GPAD operates within the following framework:

- 1 to M ports are connected to one GPAD instance;
- 1 to N terminals are connected to one port and form a PMP circuit;
- a maximum of $N \times M$ terminals access the network via one GPAD instance;
- one GPAD instance is uniquely identifiable by its NUA (X.121 address); and
- there is exactly one X.25 SVC per GPAD instance (see Figure 2).

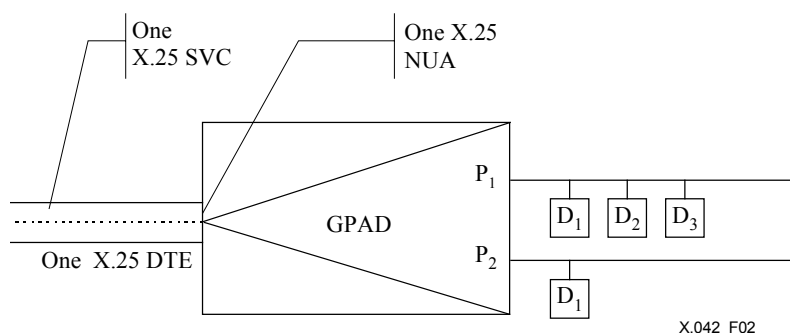


Figure 2/X.42 – GPAD minimal configuration

The minimum architecture of the subsystem from the GPAD point of view is as follows (see Figures 3 and 4):

- X.25 is considered a subnetwork access protocol (between the GPAD and the host);
- X.42 is considered a subnetwork access protocol (between the GPAD and the terminals);
- DTEs connected to one or more multipoint lines that all terminate at the same GPAD instance are considered one multipoint subnetwork; and
- the multipoint subnetwork associated with one GPAD instance is connected to the host via one X.25 SVC, and the GPAD instance is uniquely associated with and identifiable by one X.25 NUA (X.121 address) on the PDN (i.e., GPAD instance = one SVC = one NUA).

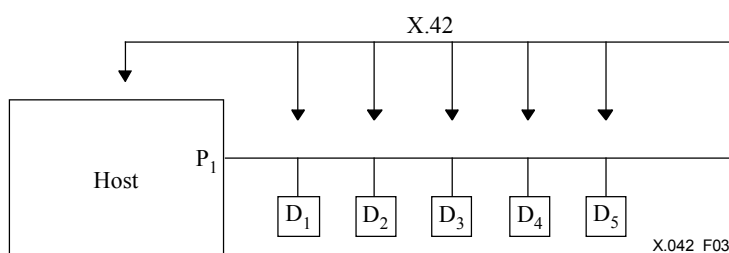


Figure 3/X.42 – GPAD minimum architecture – Traditional multipoint