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Data protocols for multimedia conferencing

ITU-T Recommendation T.120

ITU-T Recommendation T.120

Data protocols for multimedia conferencing

Summary

The T.120-series Recommendations collectively define a multipoint data communication service for use in multimedia conferencing environments. The purpose of ITU-T Recommendation T.120 is to provide an introduction and guide to the T.120 series. ITU-T Recommendation T.120 defines the T.120 architectural model and shows the interrelationships between the constituent Recommendations. Each Recommendation in the series is outlined and the requirements for T.120 compliance are specified. Annex A specifies T.120 channel and token allocations. Annex B specifies MCS domain parameters. Annex C specifies lightweight profiles for the T.120 architecture.

This revised version of ITU-T Recommendation T.120 introduces a number of clarifications to the previous version.

Source

ITU-T Recommendation T.120 was approved on 13 January 2007 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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CONTENTS

Page

1	Scope	1
2	References.....	1
3	Abbreviations and acronyms	1
4	Overview	2
5	Introduction to multipoint multimedia communication.....	3
6	The T.120 system model	5
6.1	User applications	6
6.2	Application protocols	7
6.3	Node controller.....	7
6.4	Communications infrastructure	7
6.5	Networks.....	8
7	T.120 infrastructure Recommendations	8
7.1	Protocol stacks for audiographic and audiovisual conferencing – [ITU-T T.123].....	8
7.2	Multipoint communication service (MCS) – [ITU-T T.122], [ITU-T T.125].....	9
7.3	Generic conference control (GCC) – [ITU-T T.124]	10
8	Application protocol Recommendations	10
8.1	The generic application template (GAT) – [ITU-T T.121]	10
8.2	Multipoint still image and annotation protocol (MSIA) – [ITU-T T.126]	11
8.3	Multipoint binary file transfer (MBFT) – [ITU-T T.127]	11
8.4	T.120 extensions for audiovisual control – For further study	12
8.5	Proprietary extensions to standardized protocols.....	12
8.6	Non-standard application protocols.....	12
9	T.120 compliance	12
Annex A	– T.120 channel and token allocations	14
A.1	Static channels	14
A.2	Static tokens.....	14
A.3	Standard application protocol session identifiers	14
Annex B	– MCS domain parameters	15
Annex C	– Lightweight profiles for the T.120 architecture.....	17
C.1	<i>Lite</i> T.123 profile.....	18
C.2	<i>Lite</i> T.122/T.125 profile	18
C.3	<i>Lite</i> T.124 profile.....	24
C.4	<i>Lite</i> T.121 profile.....	37

ITU-T Rec. T.120 (01/2007)

ITU-T Recommendation T.120

Data protocols for multimedia conferencing

1 Scope

This Recommendation introduces a suite of standards, collectively referred to as the T.120 series.

This Recommendation describes the T.120 system model that provides an architecture for multipoint data communication in a multimedia conferencing environment. It provides an introduction and functional description of the Recommendations that go to make up the T.120 infrastructure. In addition, it provides an overview to other Recommendations in the series that provide standardized application protocol functionality.

This Recommendation defines the criteria for compliance when the T.120 data protocols are used in a conferencing or group-working environment.

This Recommendation only covers completed work contained in approved Recommendations. When new Recommendations are approved, supporting text will be generated for inclusion in this Recommendation at the next publication date.

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 T.121] ITU-T Recommendation T.121 (1996), *Generic application template*.

[ITU-T T.122] ITU-T Recommendation T.122 (1998), *Multipoint communication service – Service definition*.

[ITU-T T.123] ITU-T Recommendation T.123 (2007), *Network-specific data protocol stacks for multimedia conferencing*.

[ITU-T T.124] ITU-T Recommendation T.124 (2007), *Generic conference control*.

[ITU-T T.125] ITU-T Recommendation T.125 (1998), *Multipoint communication service protocol specification*.

[ITU-T T.126] ITU-T Recommendation T.126 (1997), *Multipoint still image and annotation protocol*.

[ITU-T T.127] ITU-T Recommendation T.127 (1995), *Multipoint binary file transfer protocol*.

3 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

APE	Application Protocol Entity
ARM	Application Resource Manager
ASE	Application Service Element
B-ISDN	Broadband Integrated Services Digital Network

CSDN	Circuit Switched Data Network
GAT	Generic Application Template
GCC	Generic Conference Control
ISDN	Integrated Services Digital Network
LAN	Local Area Network
MBFT	Multipoint Binary File Transfer
MCS	Multipoint Communication Service
MCU	Multipoint Control Unit
MSIA	Multipoint Still Image and Annotation
PDU	Protocol Data Unit
PSDN	Packet Switched Data Network
PSTN	Public Switched Telephone Network
QoS	Quality of Service
SI	Still Image (SI is a commonly used abbreviation for MSIA)

4 Overview

The T.120-series Recommendations collectively define a multipoint communication service for use in multimedia conferencing environments. The purpose of this Recommendation is to provide an introduction and guide for the T.120 series, showing the interrelationships between the constituent Recommendations and to define the requirements for compliance to this Recommendation for conferencing.

This Recommendation provides facilities to establish and manage interactive communications (conferences) involving two or more participants on and between a variety of different networks. It provides a comprehensive data communication service for those participants, which is independent of the underlying network. Within a conference it allows communications to be established between any combination of conference participants. This Recommendation also provides support for applications and their associated protocols, defining start-up mechanisms and capability exchange procedures, etc.

This Recommendation makes provisions to ensure interoperability of commonly required functionality such as file transfer, still image exchange and shared whiteboards through the definition of standardized application protocols.

The T.120 protocols provide a means of telecommunicating many forms of Data/Telematic information between two or more multimedia terminals and of managing such communication. They provide a multipoint data communication service that has a particular application in multimedia conferencing.

The T.120 protocols are suitable for use on many types of network: PSTN, ISDN, CSDN, PSDN, B-ISDN, LANs. They provide the capability for seamless interworking of applications between terminals connected to different networks.

The T.120 protocols provide:

- support for conference establishment among a group of network nodes (such as conference terminals and MCUs);
- mechanisms to identify the participating nodes and a comprehensive roster and capability exchange mechanism;

- flexible management of communication between any combination of these elements.

The T.120 protocols can handle one or more simultaneous conferences. A terminal may participate in more than one of these if authorized to do so. The *convenor* of a conference may control the participation in that conference and the information which flows in that conference.

In a conference that allows conductorship, the convenor may delegate part or all authority to the conductor. If a conference enters conducted mode, application protocols that are "conductor aware" modify their behaviour, as specified by their protocol for this mode of operation.

This Recommendation imposes few inherent constraints on the configuration of connections between conference nodes (terminals and MCUs): but they must be arranged in a hierarchy, with a single node at the top of a tree. Nodes may be all connected to one star-point, or connected one to two others in a chain, or a chain of star-points, and so on, as long as it is clear for each connection which direction is upward and there are no loops. The top node should be present from the beginning of a conference, since any change in the top can be disruptive.

No constraint is placed on the rate or volume of information transmitted within the various media; the T.120 protocols have the capability to organize different rates of information flow, within the constraints imposed by the type of network and connections established thereon. They allow relative priorities to be set by the applications using the T.120 protocols.

The structure of the T.120 protocols is described in clause 6. Not all of the T.120 protocol provisions are mandatory: T.123, T.122/125, and T.124 are mandatory for conferencing and group working environments. The remainder are conditional: where functionality covered by the standards is provided, the standard protocols of the T.120 series must be implemented (see clause 9 for T.120 compliance requirements). This ensures that it is always possible to achieve a basic level of interworking, and does not prohibit customized enhancements and negotiation of proprietary modes if (and only if) all participating elements are able to support such modes.

5 Introduction to multipoint multimedia communication

Traditionally, telephony services have been constrained to point-to-point operation. In order to support group activities such as meetings, conferences etc., involving physically separated participants, there is a requirement to join together more than two locations. The term "multipoint communication" simply describes the interconnection of multiple terminals. Normally, a special network element, known as a Multipoint Control Unit (MCU), or more simply a bridge, is required in order to provide this function.

A conference typically refers to a group of geographically dispersed nodes that are electronically joined together and that are capable of exchanging audiographic and audiovisual information across various communication networks.

Conference participants may have access to various types of media handling capabilities such as audio only (telephony), audio and data, audio and video, or audio, video and data.

The T.120 series of Recommendations define the component which is used to provide both a data communications service, and a management service for any other media services present.

T.120 protocols provide the infrastructure required to provide data services for many types of conferencing and group working, making it suitable for a diverse range of application areas. It is expected to find use in videotelephony and audiographic conferencing as well as other forms of multipoint multimedia communication.

This Recommendation regards point-to-point connections as the simplest form (a degenerate case) of a multipoint connection. Both forms of connection are supported by the T.120 protocols. Terminals with multiple communication ports (each with an appropriate T.120 transport stack) can act as T.120 data bridges and allow multipoint connections to be established involving three or

more nodes. Figure 1 b) shows a four site conference with multiport terminals acting as data bridges.

MCUs are nodes that do not normally support terminal functionality. They act as bridging nodes, bridging data and other media streams present in the connections. Figure 1 c) shows an example of how three MCUs may be connected to bridge a group of terminals.

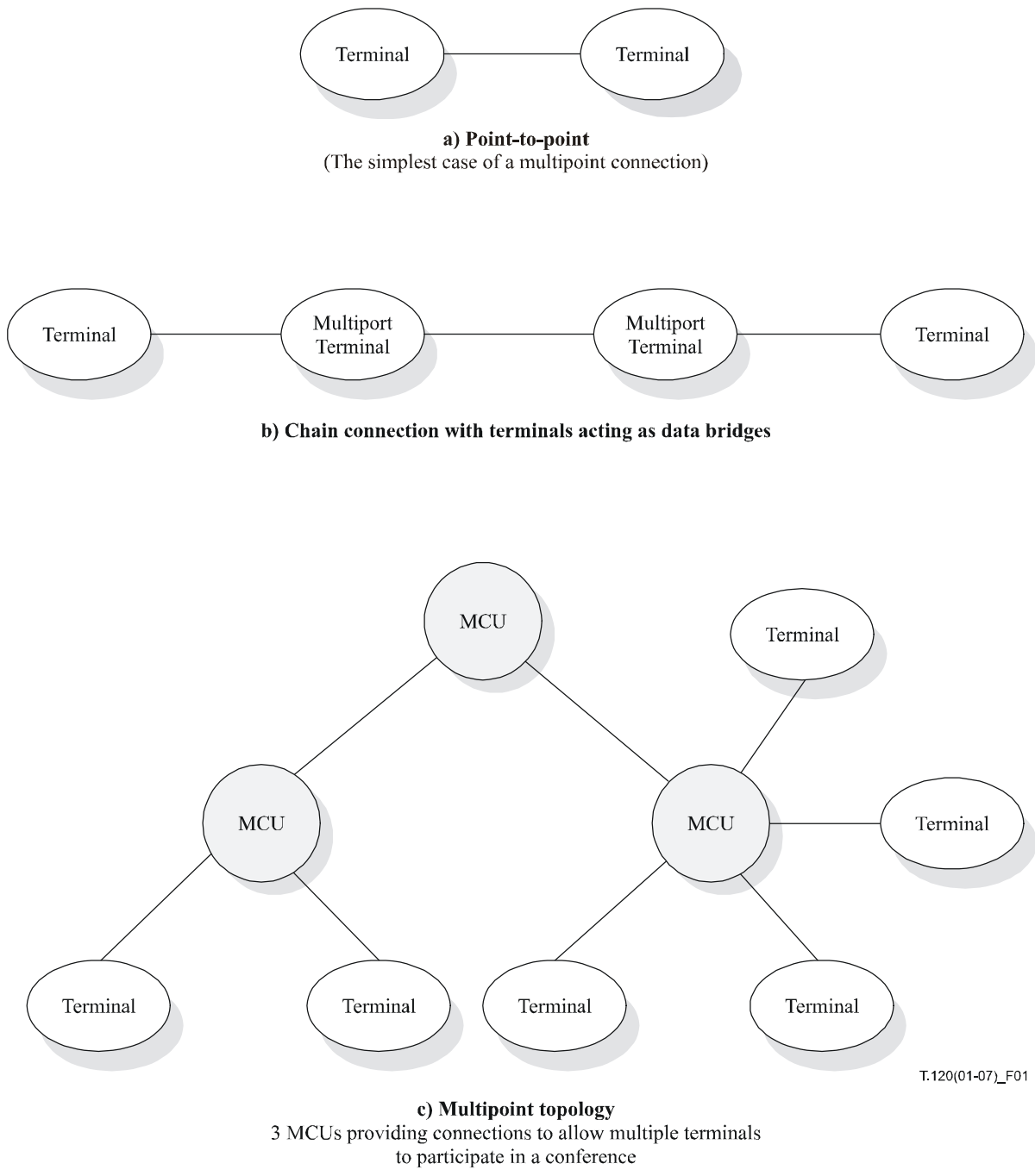


Figure 1 – Examples of multipoint conference configurations showing various connection topologies and node types

Figure 2 is an example of a conference that involves terminals of diverse capability, on multiple different networks and across administrations.

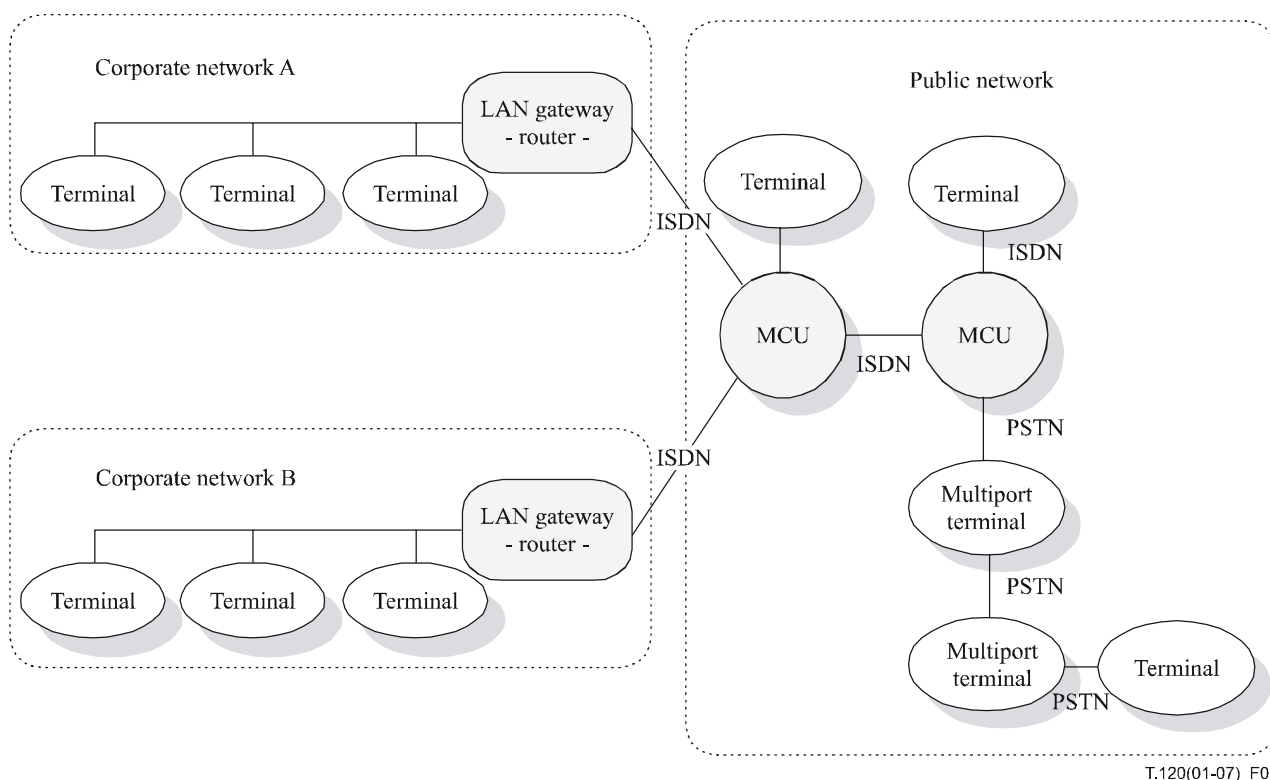


Figure 2 – Example of a mixed-network conference topology

6 The T.120 system model

The T.120 model is comprised of a communications infrastructure and the application protocols that make use of it. Figure 3 shows the full model with both standardized and non-standardized applications. The model serves to show both the scope of the T.120 series of Recommendations (indicated by the shaded background) and the relationship between each of the Recommendations and other components in the system.

Generally, each layer provides services to the layer above and communicates to its peer(s) by sending Protocol Data Units (PDUs) via services provided by the layer below.

This clause will address each of the major functional levels in Figure 3: User applications, Application protocols, Node controller, Communications infrastructure and Networks.

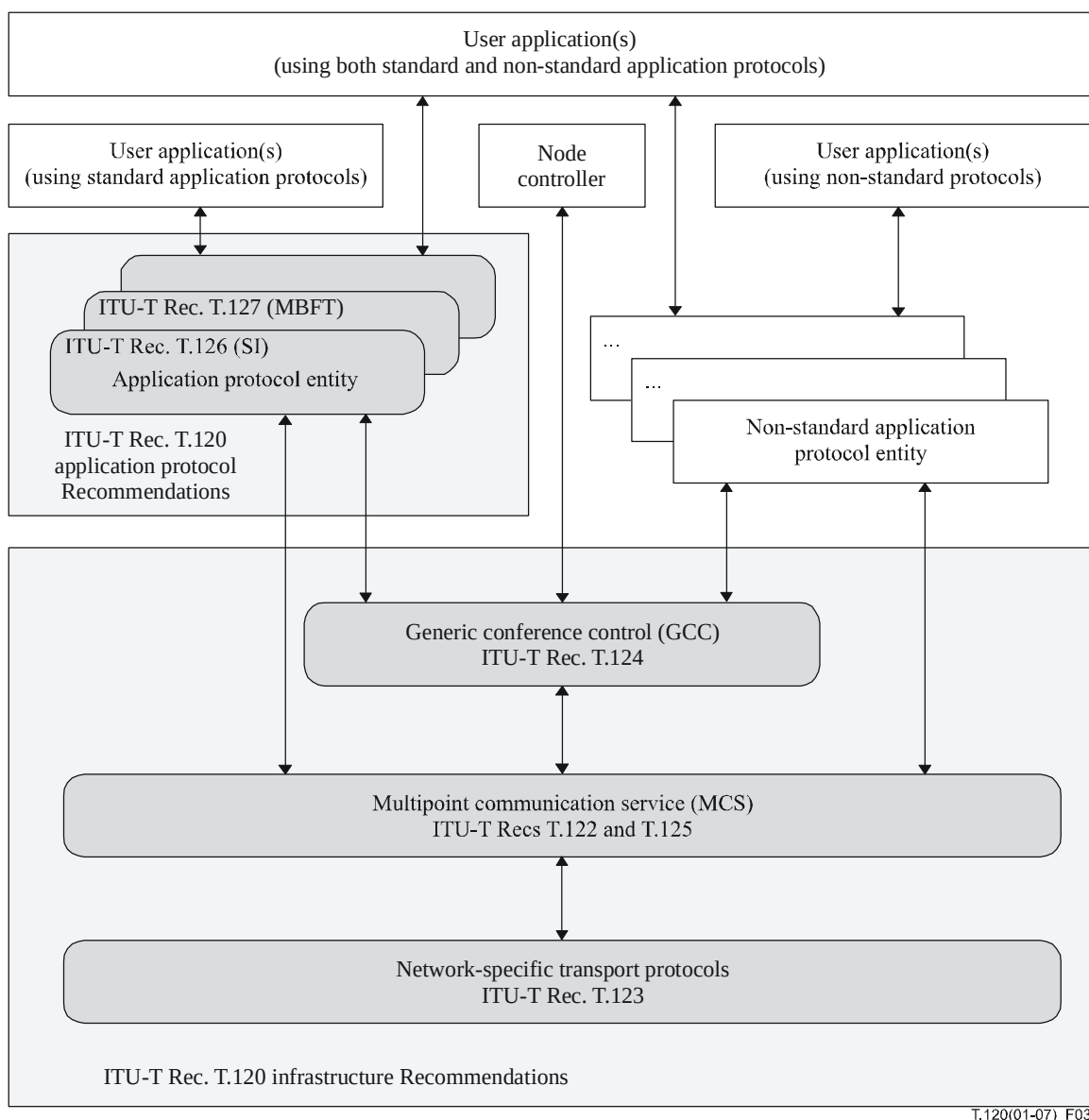


Figure 3 – T.120 system model

6.1 User applications

Applications *per se* are not the subject of standardization in the T.120-series Recommendations. Applications that use the services offered by the T.120 series Recommendations will generally be multipoint aware and designed to use the T.120 services provided by GCC and MCS. These applications are termed "User Applications" and they may use any combination of standardized and non-standard protocols to communicate with peer user applications. The T.120 environment supports multiple user applications concurrently operating in the same conference by providing mechanisms for the applications to coordinate the use of communications resources. The Generic Application Template [ITU-T T.121] provides guidance to user application developers on how to utilize the T.120 infrastructure in a coherent and consistent way. A user application addresses those tasks which have no direct effect on interworking (e.g., user interface) and which may thus be product and platform specific. The influence of the user application is felt at other sites through the application protocols it employs.

6.2 Application protocols

Application protocols comprise a set of protocol data units (PDUs) and associated actions for application peer-to-peer(s) communication. These may be proprietary protocols or they may be standardized by the ITU-T or other international or national standards bodies. The T.120 series Recommendations includes a set of application protocols designed to meet the needs of multipoint conferencing. These protocols define minimum requirements in order to ensure interworking between different implementations. [ITU-T T.127] provides simultaneous multipoint file transfer. [ITU-T T.126] provides still image viewing and annotation, shared whiteboard, and facsimile. A given application may use any combination of standardized and non-standard application protocols.

An Application Protocol Entity is an instance of an application protocol. It may be considered as comprising of two functional components: the application resource manager (ARM), that provides the generic functionality relevant to all protocols; and the application service element (ASE), that provides the application-specific functionality. Both of these are described further in the T.121 generic application template recommendation. [ITU-T T.121] presents templates and guidelines which may assist in the definition of new application protocols.

6.3 Node controller

The node controller is the element that provides the T.120 management role at a terminal or MCU. It issues primitives to the GCC provider which starts and controls the communication session. The node controller itself is outside the scope of the T.120 series of Recommendations, and only where it communicates to GCC are its interfaces defined. However, correct interaction with GCC imposes some normative requirements on the node controller.

6.4 Communications infrastructure

The communications infrastructure provides multipoint connectivity with reliable data delivery. It can accommodate multiple independent applications concurrently using the same multipoint environment. Connections between nodes can be any combination of circuit-switched telecommunications networks and packet-based LANs and data networks. The T.120 infrastructure is composed of three standardized components: Generic conference control (GCC), the multipoint communication service (MCS) and transport protocol profiles for each of the supported networks.

Generic conference control

GCC provides a set of services for setting up and managing the multipoint conference. It provides access control and arbitration of capabilities. GCC facilities are used by applications to coordinate the use of MCS channels and tokens. GCC facilities can be used to query an MCU or multipoint terminal node to find a desired conference. Multiple applications can be running on any given node and can be dynamically launched, used and shut down during a conference. As part of the management role, peer GCC providers exchange information about the applications present and their capabilities. GCC also makes a centralized registry facility available to applications in order to identify dynamically assigned resources such as channels and tokens.

Multipoint communication service

MCS provides a general purpose multipoint connection-oriented data service. It collects point-to-point transport connections and combines them to form a multipoint domain. Within that domain, a large number of logical channels are provided that can provide one-to-one, one-to-many and many-to-one data delivery. Nodes within an MCS domain are hierarchically organized in a tree structure. Data delivery normally follows the most efficient path to the nodes that are to receive the data, but a mechanism is provided to guarantee that data originating from different nodes is received in the same sequence at all nodes. MCS acts as a resource provider to the layers above, independent of the underlying network, providing channels and token resources on demand. Tokens are provided for applications to use for coordinating events and processes.

Network-specific transport protocols

[ITU-T T.123] provides reliable point-to-point sequenced data delivery of MCS PDUs and segmentation of that data if necessary. [ITU-T T.123] specifies a protocol stack for each particular network supported. [ITU-T T.123] presents a uniform OSI Transport Service interface to the MCS layer above.

6.5 Networks

The T.120-series Recommendations suite provide for operation over the following networks:

- ISDN – Integrated Services Digital Network as defined in the I-series Recommendations.
- CSDN – Other (switched or permanent) digital circuits.
- PSDN – Packet Switched Data Network using ITU-T Rec. X.25.
- PSTN – Public Switched Telephone Network (or compatible service).
- Use of this Recommendation on other networks such as B-ISDN and LANs is currently under study. Alternative protocol stack profiles may be defined in the future.

The approach taken with the T.120 architecture leads to the multipoint routing information being located in MCS above the transport stacks; this is the key to the network independence that can be achieved with this Recommendation.

The various Recommendations that comprise the T.120-series Recommendations suite are described in greater detail in clauses 7 and 8.

7 T.120 infrastructure Recommendations

The T.120 protocols are designed to operate over a wide range of networks and indeed to facilitate communication between endpoints on a mixture of networks. The differences in T.120 operation for the various networks are confined to the lowest layers as detailed in [ITU-T T.123].

7.1 Protocol stacks for audiographic and audiovisual conferencing – ITU-T Rec. T.123

[ITU-T T.123] defines the network-specific transport stacks for each supported network. Generally, existing link layer protocols appropriate to each network are selected and then mapped into a common interface layer, thus defining a transport profile for a given network. At Transport level the conference is seen as a group of point-to-point connected pairs (different pairs may be on different networks). The multipoint communication service (MCS), takes the transport pairs from the layer below it and maps them into a multipoint domain. See Figure 4.

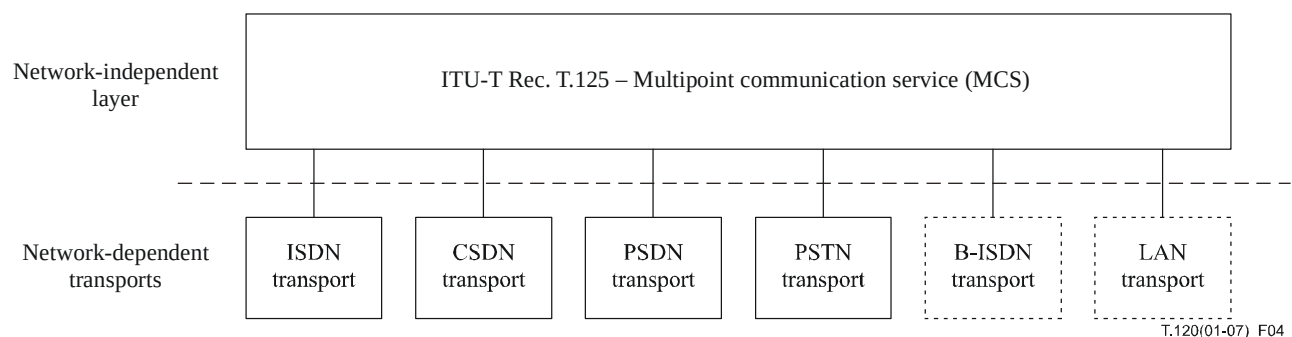


Figure 4 – Protocol stacks – defined in ITU-T Rec. T.123