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OF ITU

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SERIES T: TERMINAL EQUIPMENTS AND PROTOCOLS FOR TELEMATIC SERVICES

Data protocols for multimedia conferencing

ITU-T Recommendation T.120

(Previously CCITT Recommendation)

ITU-T RECOMMENDATION T.120

DATA PROTOCOLS FOR MULTIMEDIA CONFERENCING

Summary

The T.120-Series of Recommendations collectively define a multipoint data communication service for use in multimedia conferencing environments. The purpose of this Recommendation is to provide an introduction and guide to the T.120-Series. This Recommendation 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.

Source

ITU-T Recommendation T.120 was prepared by ITU-T Study Group 8 (1993-1996) and was approved under the WTSC Resolution N°1 procedure on the 3rd of July 1996.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. Some 179 member countries, 84 telecom operating entities, 145 scientific and industrial organizations and 38 international organizations participate in ITU-T which is the body which sets world telecommunications standards (Recommendations).

The approval of Recommendations by the Members of ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, 1993). In addition, the World Telecommunication Standardization Conference (WTSC), which meets every four years, approves Recommendations submitted to it and establishes the study programme for the following period.

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.

CONTENTS

Recommendation T.120

DATA PROTOCOLS FOR MULTIMEDIA CONFERENCING

(Geneva, 1996)

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 Normative references

The following 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: all 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.

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

– ITU-T Recommendation T.122 (1993), *Multipoint communication service for audiographics and audiovisual conferencing service definition.*

– ITU-T Recommendation T.123 (1994), *Protocol stacks for audiographic and audiovisual teleconference applications.*

– ITU-T Recommendation T.124 (1995), *Generic conference control.*

– ITU-T Recommendation T.125 (1994), *Multipoint communication service protocol specification.*

– ITU-T Recommendation T.126 (1995), *Multipoint still image and annotation protocol.*

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

3 Symbols and abbreviations

For the purposes of this Recommendation, the following abbreviations are used.

ASE Application Service Element

ARM Application Resource Manager

APE	Application Protocol Entity
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 of 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 T.120 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.

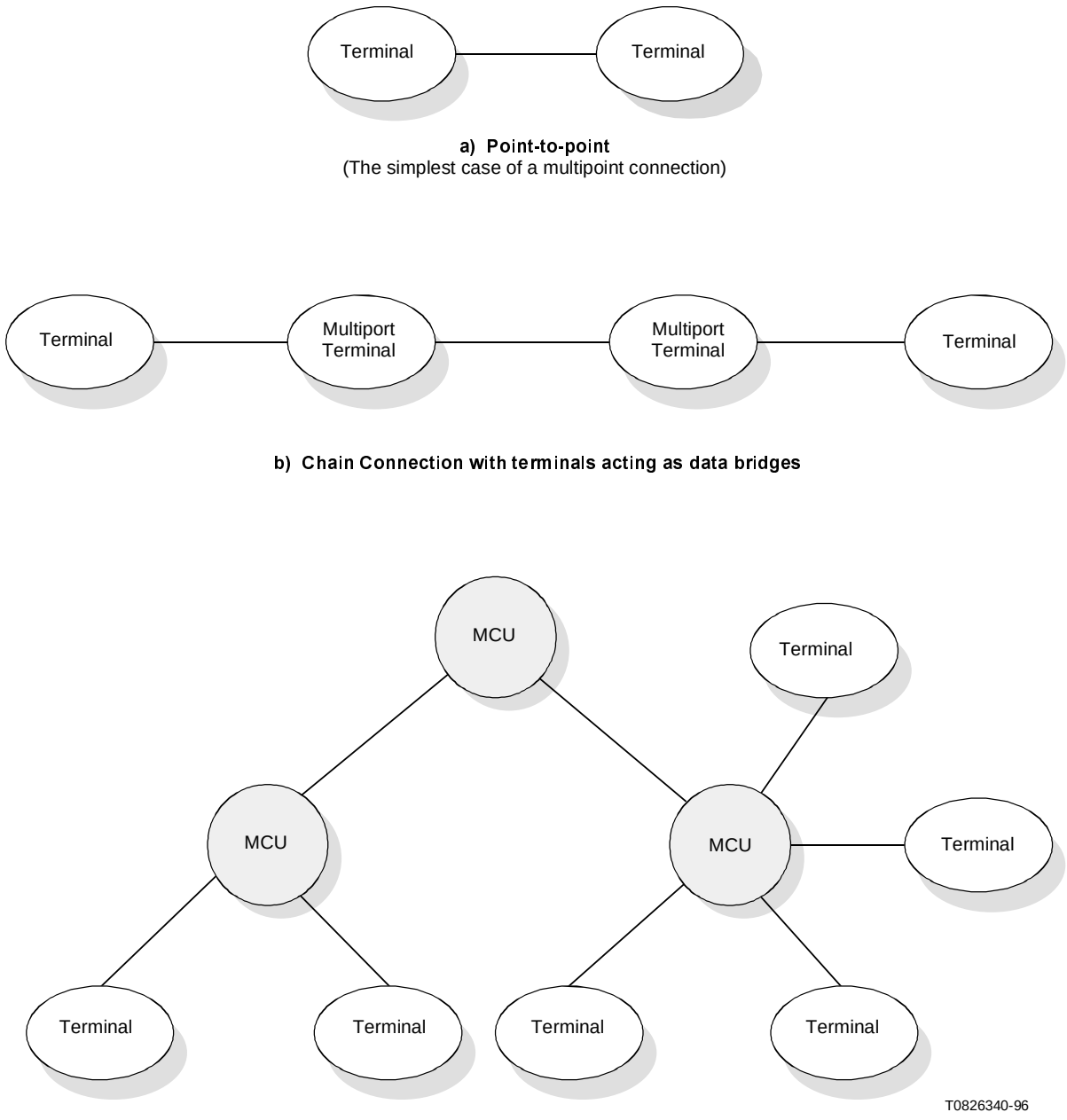

FIGURE 1/T.120

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.

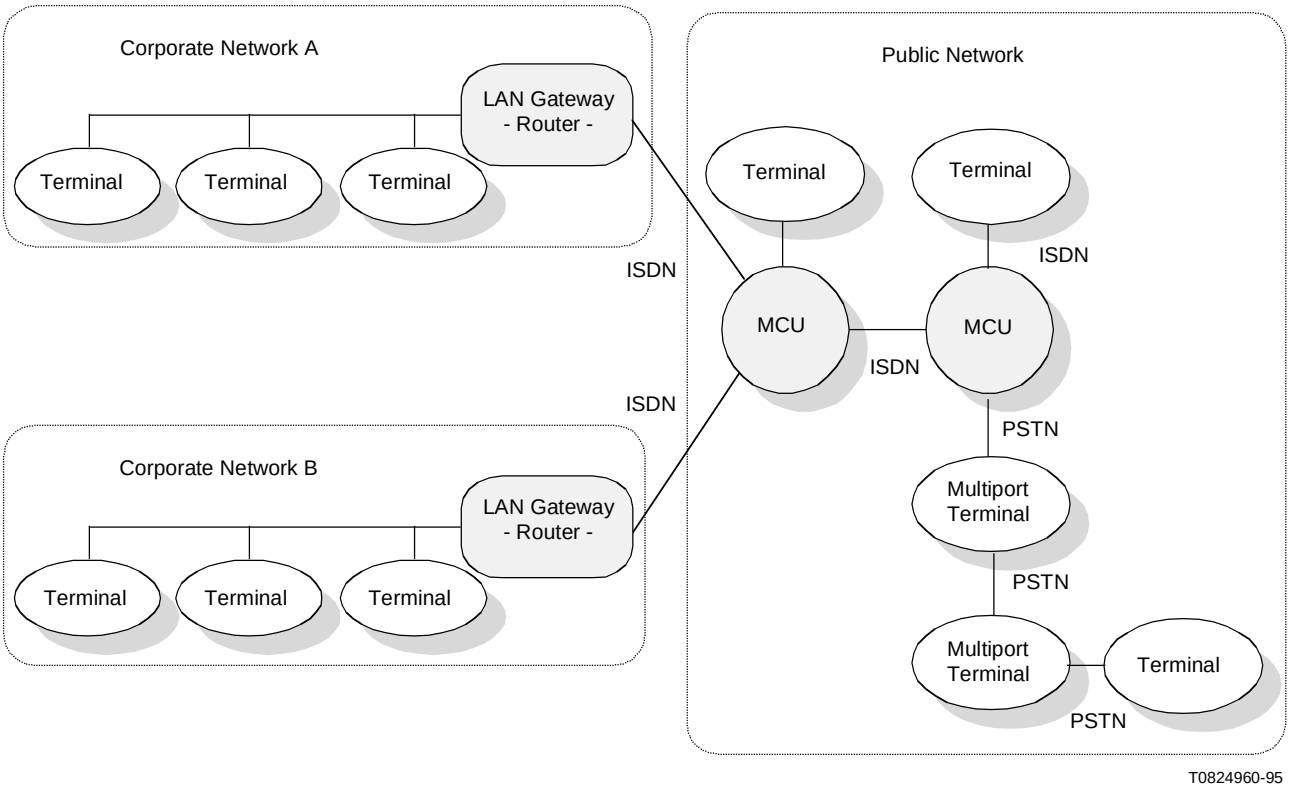

FIGURE 2/T.120

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 suite 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.

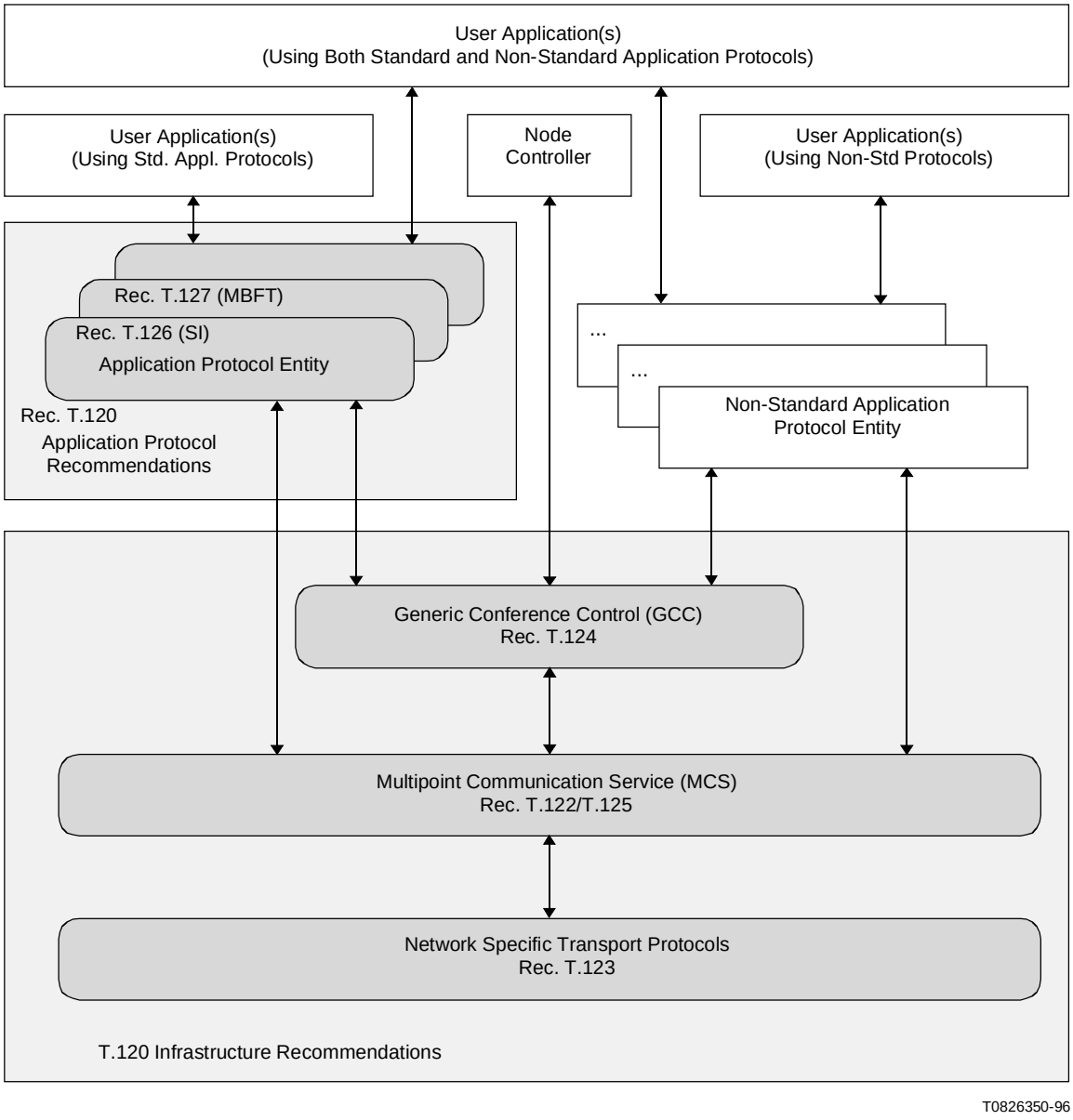

FIGURE 3/T.120

T.120 system model

6.1 User applications

Applications *per se* are not the subject of standardization in the T.120-Series. Applications that use the services offered by the T.120-Series 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 (Recommendation 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 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. Recommendation T.127 provides simultaneous Multipoint file transfer. Recommendation 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. Recommendation 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 multiport 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

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

6.5 Networks

The T.120 suite provides 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 Recommendation 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 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 Recommendation T.123.

7.1 Protocol stacks for audiographic and audiovisual conferencing – Recommendation T.123

Recommendation 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.

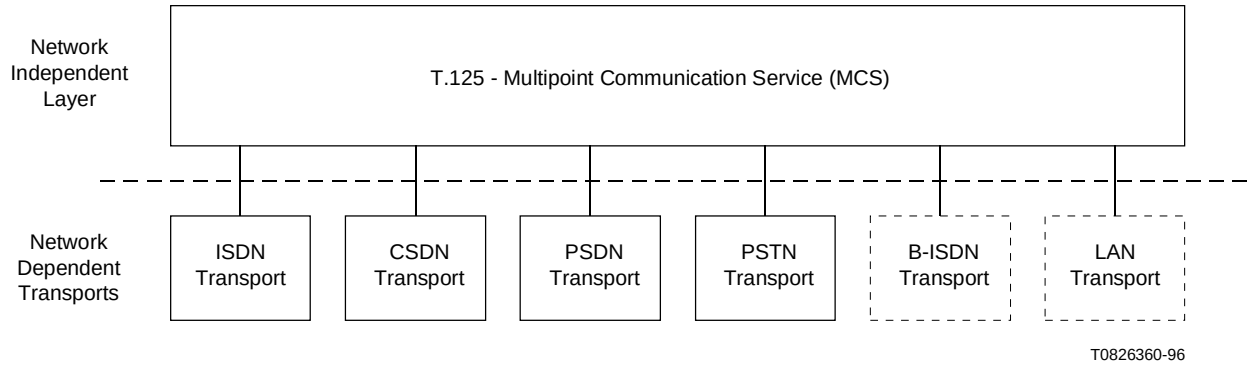

FIGURE 4/T.120

Protocol stacks – defined in Recommendation T.123

7.2 Multipoint Communication Service (MCS) – Recommendations T.122, T.125

The Multipoint Communication Service (MCS) is contained in two Recommendations: T.122 defines the MCS service and T.125 the protocol which is mandatory.

MCS is a key element in the infrastructure of T.120. It takes the point-to-point transport connections provided by the layers below it and combines them to form a multipoint domain. The T.120 protocol can handle a multiplicity of Domains - each effectively an independent conference or group activity. Nodes may participate in more than one domain.

A domain with only two terminal nodes participating mirrors the traditional point-to-point communications model and is fully supported by MCS but with the potential of introducing more nodes as required.

Each connected pair in an MCS domain is ordered, so that one node is higher than the other. The domain must rise hierarchically (without loops) to a top node. The MCS Provider at the top node is assigned the Top Provider role, acting as the resource server for the domain.

The MCS provides transport of control and data streams from one terminal to any or all others in the conference. It does not need to know anything about the content of application data streams.

MCS introduces the concept of channels to provide data distribution within a domain; an MCS channel connects all the nodes which have expressly joined it. It is not required that a channel be joined in order to send to it. Data sent to a channel will be conveyed to all other nodes which have joined that channel. MCS supports four types of channel.

A "static" channel exists when a domain is established. MCS reserves a block of channel identifiers for static use. Static channels may be given preassigned roles by the protocols making use of MCS services (such roles are not of concern to MCS). Annex A defines the mapping of preassigned roles to channel identifiers. Any node may join a static channel, and there is no "owner".

A "dynamic" channel is created on request by any node or application. Dynamic channels come in three forms: "Multicast", "Private" and "Single Member". Multicast (Assigned) channels are similar to static channels in that they are open access - any terminal may join them, and there is no owner. Private channels however are owned by their creator and are joined by invitation only, thus forming a private or closed-user-group. A "Single Member" channel is normally used to provide a User Identifier, giving the owner a unique address within the domain.

There are two specified types of data: ordinary data is sent by the shortest route to its destinations - nothing governs the order in which information arrives from different source terminals, so it can

happen that presentations to users may not be identical. Uniform sequenced data, on the other hand, is routed to a common point (the top MCU in the connection hierarchy, called the "top provider") and distributed thence to all relevant terminals in the same order; clearly this may take longer than for ordinary data.

MCS supports four data priorities; according to the priority requested in the header of data primitives coming down into MCS, they are routed into one of up to four corresponding transport connections.

MCS provides a token management service and is able to support the use of a range of tokens. In order to provide exclusivity, and thus consistency across a domain only the Top Provider is able to execute actions on tokens. MCS supports the following token actions; grab, inhibit, give, please and release. The role allocated to tokens is assigned by the layers above MCS (and is not the concern of MCS).

Much of the power and flexibility of MCS derives from its provision of services in a manner that is independent of the underlying network connections. This allows portability across networks and an inherent capability to interwork between terminals on different networks.

7.3 Generic Conference Control (GCC – Recommendation T.124)

The Generic Conference Control (GCC) service and protocol is defined in Recommendation T.124; it resides above MCS in the T.120 stack infrastructure. GCC is a mandatory component for peer-to-peer conferencing and group working environments, providing a high-level framework for management and control in support of a diverse range of terminals and MCUs.

A GCC conference has a direct correspondence to an MCS Domain. GCC provides mechanisms for the creation, control and the termination of conferences. It also makes provision for building and distributing the conference and application databases.

MCS supports four data priorities, one of which (top priority) is reserved for exclusive use by GCC for control and management. The remaining three priorities are available for application use.

GCC reserves a block of MCS tokens and designates them to be static and thus assigned functionality by this Recommendation (Annex A). The remaining tokens are designated dynamic and their functionality is assigned in the registry and is valid only for the duration of a conference session.

The conference roster contains a record of the conference configuration, that includes such things as the name of the conference, the types of participating nodes (terminal, MCU or Multiport terminal), and site and participant information for each node.

When a node joins a conference it announces its presence to that conference. This causes the conference roster to be updated and distributed.

GCC supports the enrolment in a conference of application protocols. Each GCC provider maintains a local application roster containing information and capabilities for its enrolled application protocols. The local rosters are sent to the top node of a conference where a Conference Application Roster is compiled and then distributed. In this way all nodes learn of the additional capabilities of their peers.

Once enrolled, application protocols entities are free to use MCS resources as described in the Generic Application Template (Recommendation T.121). However if the conference enters conducted mode permission may be required before an application protocol entity can act.

8 Application protocol Recommendations

T.120-Series includes application protocols that provide commonly required functionality to user applications, in a way that ensures a guaranteed level of interworking across a diverse range of terminals with differing capabilities.

8.1 The Generic Application Template (GAT) – Recommendation T.121

Recommendation T.121 defines a conceptual model of a T.120 application protocol. It serves as a guide to application protocol developers, ensuring a consistent approach to the development of application protocols. It also provides guidance to user application developers on how to utilize the T.120 infrastructure to best effect.

The model consists of two functionally distinct parts; the Application Resource Manager (ARM) and the Application Service Element (ASE). The ARM is responsible for managing GCC and MCS resources on behalf of the ASE.

The ARM provides generic functionality, available to all application protocols. It effectively defines a template to which specific application functionality can be added. The functionality provided by the template is required by all application protocols; both standard and non-standard. Compliance to the template is mandatory for standardized application protocols. Although not mandatory for non-standard application protocols, it is recommended, to ensure consistency and reduce the potential for unforeseen interaction between different protocols.

The ASE provides application-protocol-specific functionality, independent of the type of channel and token resources provided to it by the ARM. See Figure 5.

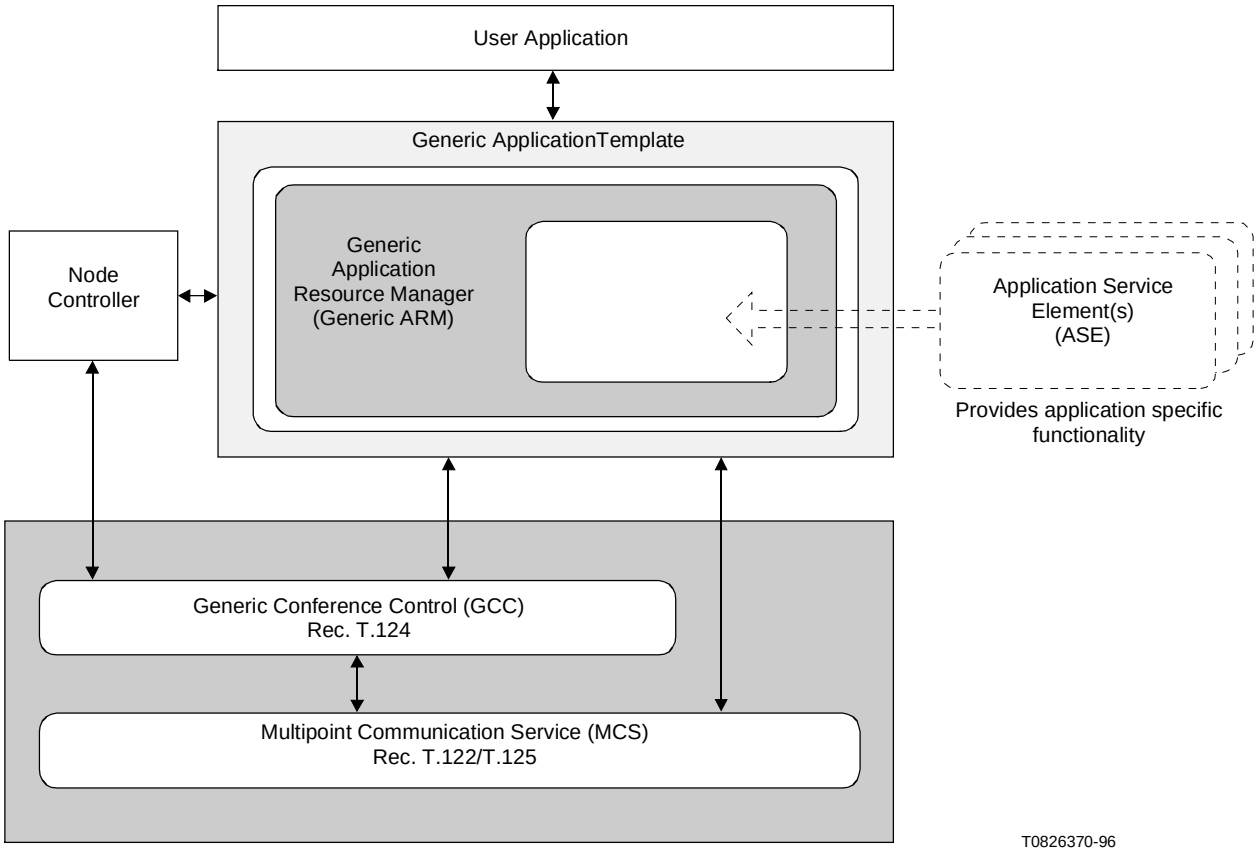

FIGURE 5/T.120

Generic Application Template

8.2 Multipoint Still Image and Annotation Protocol (MSIA) – Recommendation T.126

Recommendation T.126 defines the protocol to be used by a broad set of user applications that require interoperable graphical information exchange in a multi-vendor environment. It can be employed by user applications requiring simple whiteboarding, annotated image exchange and hard copy image exchange as well as for more advanced functions such as remote computer application piloting and screen sharing. The protocol manages the conference-wide synchronization of multi-plane/multi-view graphical workspaces. An extensible set of bitmap, pointer and parametric drawing primitives can be directed to these workspaces. Advanced options such as keyboard and pointing device signalling to support computer application remote piloting and screen sharing are also defined. All aspects of the protocol have provisions for in-band extensibility to allow any new or extended primitives that are not defined to be added and detected within a conference.

8.3 Multipoint Binary File Transfer (MBFT) – Recommendation T.127

Recommendation T.127 defines a protocol to support interchange of binary files within an interactive conferencing or group working environment. It does not impose any restrictions on the content of the files to be transferred. It is a versatile, lightweight protocol which provides the core functionality to allow interworking between applications requiring a basic general purpose file transfer capability. It also has the flexibility to meet the demands of more sophisticated applications. Mechanisms are provided which facilitate both distribution and retrieval of files.

A basic file transfer application conforming to Recommendation T.127 may simply offer the ability to broadcast one file at a time to all applications which support the MBFT protocol. Optional advanced features defined in Recommendation T.127 include:

- broadcast of multiple files simultaneously;
- private distribution of files to a selected subset of the conference;
- conductor control of file distribution.

8.4 T.120 extensions For audiovisual control – For further study

8.5 Proprietary extensions to standardized protocols

Extensions to standardized protocol may be made by making use of the non-standard PDU or other elements that have been reserved in the relevant specifications for proprietary use.

8.6 Non-standard application protocols

Provision of additional functionality may be made by creation of additional proprietary application protocols which use the resources of MCS and GCC. Where separate proprietary protocols are defined it is recommended that the Generic Application Template (Recommendation T.121) be used as the model for the generic component of Application Protocol, the Application Resource Manager. Guidance on extension, modification and reuse of existing application protocols is given in Recommendation T.121. A non-standard application protocol entity must use GCC in a way that does not risk conflict with other application protocol entities. In particular it shall not use static channels or static tokens and must enroll using a non-standard application protocol key.

9 T.120 compliance

For use within a multimedia conferencing environment, this Recommendation requires:

- compliance with the Transport Protocol stack profile (Recommendation T.123) for the selected networks;
- compliance with the Multipoint Communication Service protocol (Recommendation T.125);
- compliance with the mandatory parts of Generic Conference Control (Recommendation T.124);
- compliance with the mandatory parts of any standardized application protocols that have scope covering functionality supported by the user applications.

Compliance to this Recommendation is specified in Table 1.

Options within each item are clearly set out within the requisite standard; thus, except where otherwise stated, in this table compliance means to the minimum requirement of the standard.

TABLE 1/T.120

T.120 compliance table

Item (Recommendation)	Status	Conditions
T.121	Conditional	Mandatory when specified by an application protocol
T.123	Mandatory	Basic mode profile, according to network type
T.124 (GCC)	Mandatory	Mandatory protocol elements - as specified in Table 6-1/T.124, according to node type Conditional protocol elements - requirement dependent on the needs of application protocols to be supported at the node In addition a node attempting to enter an existing conference via GCC-Conference-Join request shall specify exactly the minima and maxima of the MCS domain parameter values defined in Annex B as its allowed range of negotiation
T.125 (MCS)	Mandatory	The defined protocol is mandatory. The domain parameter values selected for an MCS domain shall lie within the ranges defined in Annex B
T.126 (MSIA)	Conditional	Mandatory when a node makes use of one or more of the following features: • exchange of soft copy still images; • exchange of hard copy still images (including FAX); • shared whiteboard functionality; • exchange of annotated soft copy still images. In the above cases it must be possible to activate the standard base session for Rec. T.126 for the same purpose. Annex A/T.126 defines those parts of Rec. T.126 that are mandatory for each of the above functions
T.127 (MBFT)	Conditional	Mandatory for general purpose file transfer applications It must be possible to activate the standard base session for Rec. T.127

Annex A

T.120 channel and token allocations

(This annex forms an integral part of this Recommendation)

A.1 Static channels

Symbolic name	MCS channel ID	Description	Recommendation
GCC-CHANNEL-0	1	GCC Broadcast Channel	T.124
GCC-CHANNEL-1	2	Convenor Channel	T.124
SI-CHANNEL-0	8	MSIA Communications Channel	T.126
MBFT-CHANNEL-0	9	Control Channel	T.127
MBFT-CHANNEL-1	10	Data Channel	T.127

A.2 Static tokens

Symbolic name	MCS token ID	Description	Recommendation
GCC-TOKEN-0	1	Conductors Token	T.124
SI-TOKEN-0	8	Bit Map Create Token	T.126
SI-TOKEN-1	9	Workspace Create Token	T.126
MBFT-TOKEN-0	10	File Transmit Token	T.127
MBFT-TOKEN-1	11	File Receive Token	T.127

A.3 Standard application protocol session identifiers

Application protocol Recommendation	MCS channel identifier used as session identifier
T.126	SI-CHANNEL-0
T.127	MBFT-CHANNEL-0

Annex B

MCS domain parameters

(This annex forms an integral part of this Recommendation)

The MCS protocol (Recommendation T.125), states that MCS providers allocate resources and execute procedures according to the domain parameters established for any given domain. The establishment of the first MCS connection between two nodes fixes the domain parameters for all subsequent joiners.

In order to avoid the possibility of these values being set at values inconsistent with the requirements of later nodes, this Recommendation requires that MCS domain parameter settings adhere to the specified ranges in all situations.

In addition, a node attempting to enter an existing conference via GCC-Conference-Join request shall specify exactly the minima and maxima of the MCS domain parameter values defined in this Annex as its allowed range of negotiation.

NOTE - It is possible for MCS domain parameters to be negotiated out-of-band prior to conference establishment. However, only in cases where it could be guaranteed that all participating nodes can conform to the agreed values, is it permissible to specify values other than those defined in this annex. This method is not recommended, and could cause subsequent connections to fail.

a) Maximum number of MCS channels that may be in use simultaneously. This includes channels that are joined by any user, channel IDs that have been assigned, and private channels that have been created.

Minimum value	10
Maximum value	65 535

b) Maximum number of user ids that may be assigned simultaneously. This is a sub-limit within the constraint of the preceding parameter.

Minimum value	10
Maximum value	64 535

c) Maximum number of token ids that may be grabbed or inhibited simultaneously.

Minimum value	0
Maximum value	65 535

d) Number of data transfer priorities implemented. This equals the number of transport connections in an MCS connection. An MCS user may still send and receive data with priorities outside the limit. However, such priorities may be treated the same as the lowest priority that is implemented.

Minimum value	1
Maximum value	4

e) Enforced throughput. Although global flow control limits data transfer within a domain to the rate of the slowest receiver, receivers must not be allowed to run arbitrarily slowly. Otherwise, one party in a conference may obstruct all others. This parameter instructs MCS providers to enforce a minimum receiving rate at each MCS attachment and over each downward MCS connection. Violators run the risk of being involuntarily detached or disconnected, respectively.

Minimum value	0 (no minimum rate enforced)
Maximum value	0 (no minimum rate enforced)

f) Maximum height. This constrains the height of all MCS providers, in particular the top provider.

Minimum value	2
Maximum value	100

g) Maximum size of domain MCSPDUs. Global flow control is based on buffering domain MCSPDUs within an MCS provider (but not connect MCSPDUs). For simplicity, fixed-size buffers are assumed. An MCS provider shall not generate larger MCSPDUs. This constrains the amount of information that can be packed into a single control MCSPDU and suggests where unlimited user data should be segmented in data MCSPDUs.

Minimum value	128 octets
Maximum value	4096 octets

h) Protocol version. This takes one of two values defining different encodings for domain MCSPDUs.

Minimum value	Version 2 (Packed Encoding Rules for all but connect PDUs)
Maximum value	Version 2 (Packed Encoding Rules for all but connect PDUs)

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