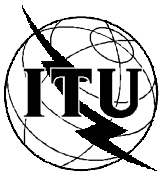

INTERNATIONAL TELECOMMUNICATION UNION

CCITT

T.431

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

(09/92)

TERMINAL EQUIPMENT AND PROTOCOLS FOR TELEMATIC SERVICES

DOCUMENT TRANSFER AND MANIPULATION (DTAM) – SERVICES AND PROTOCOLS – INTRODUCTION AND GENERAL PRINCIPLES

Recommendation T.431

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT 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 Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation T.431 was revised by Study Group VIII and was approved under the Resolution No. 2 procedure on the 18 of September 1992.

CCITT NOTE

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

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INTRODUCTION

This Recommendation is one of a set of T.400-Series Recommendations to facilitate the interconnection of Telematic systems and terminals. It is related to other CCITT Recommendations in the set as defined by the Reference Model for Open Systems Interconnection (see Recommendation X.200). The Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The T.430-Series Recommendations define a Document Transfer and Manipulation (DTAM) Service and specify a DTAM Protocol available within the Application Layer of the Reference Model. The DTAM defined in this series of Recommendations is one of the Application Service Elements (ASE), which is specifically designed for document handling. It is concerned with identifiable bodies of information which can be treated as documents, and which may be stored within open systems or accessed, transferred and manipulated between application processes.

This Recommendation and Recommendations T.432 and T.433 define general principles and application rules, basic DTAM services, and protocol, respectively. They provide sufficient facilities to support DTAM and establish a framework for DTAM management.

This Recommendation defines in an abstract way application rules of the DTAM service. DTAM applications defined using these series of Recommendations are specified in terms of service classes. A service class consists of a combination of functional units and communication support functions.

The term document used in this series of Recommendations covers ODA documents as well as other types of information, e.g. files.

Recommendation T.431

DOCUMENT TRANSFER AND MANIPULATION (DTAM) – SERVICES AND PROTOCOLS – INTRODUCCION AND GENERAL PRINCIPLES

(revised 1992)

1 Scope and field of application

This Recommendation defines in an abstract way application rules of the DTAM service. Applications defined using this series of Recommendations are specified in terms of service classes. A service class consists of a combination of functional units and communication support functions. The combination of functional units and communication support functions are

1) *Functional units provided by DTAM*

– association use control unit (Kernel);

– capability unit;

– document bulk transfer unit;

– document unconfirmed manipulation unit;

– document confirmed manipulation unit (see Note);

– typed data transfer unit;

– remote document management unit (see Note);

– remote document access unit (see Note);

– token control unit;

– exception report unit (see Note).

Note – The use of these functional units is left for further study.

2) *Communication support functions*

– Association Control Service Element (ACSE) and Presentation layer service;

– Reliable Transfer Service Element (RTSE);

– Remote Operation Service Element (ROSE) (see Note);

– Session service (see Recommendation X.215) according to the rule of Recommendation T.62 *bis*.

Note – The use of this communication support function is left for further study.

2 References

– Recommendation T.62 *bis, Telematic control procedures for Teletex and Group 4 Facsimile Services based on Recommendations X.215 and X.225.*

– Recommendation T.400, *Introduction to Document Architecture, Transfer and Manipulation.*

– Recommendation T.411, *Open Document Architecture (ODA) and Interchange Format – Introduction and General Principles.*

– Recommendation T.412, *Open Document Architecture (ODA) and Interchange Format – Document Structures.*

– Recommendation T.414, *Open Document Architecture (ODA) and Interchange Format – Document Profile.*

– Recommendation T.415, *Open Document Architecture (ODA) and Interchange Format – Open Document Interchange Format (ODIF).*

– Recommendation T.416, *Open Document Architecture (ODA) and Interchange Format – Character Content Architectures.*

– Recommendation T.417, *Open Document Architecture (ODA) and Interchange Format – Raster Graphics Content Architectures.*

– Recommendation T.418, *Open Document Architecture (ODA) and Interchange Format – Geometric Graphics Content Architectures.*

– Recommendation T.432, *Document Transfer and Manipulation (DTAM) – Services and protocols: Service Definition.*

– Recommendation T.433, *Document Transfer and Manipulation (DTAM) – Services and protocols: Protocol Specification.*

– Recommendation T.441, *Document Transfer and Manipulation (DTAM) – Operational Structure.*

– Recommendation X.200, *Open Systems Interconnection (OSI) - Model and Notation – Reference Model of Open Systems Interconnection for CCITT Applications.*

– Recommendation X.208, *Open Systems Interconnection (OSI) – Model and Notation – Specification of Abstract Syntax Notation One (ASN.1).*

– Recommendation X.209, *Open Systems Interconnection (OSI) – Model and Notation – Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).*

– Recommendation X.210, *Open Systems Interconnection (OSI) – Service Definitions – Open Systems Interconnection Layer Service Definition Conventions.*

– Recommendation X.215, *Open Systems Interconnection (OSI) – Service Definitions – Session Service Definition for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.216, *Open Systems Interconnection (OSI) – Service Definitions – Presentation Service Definition for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.217, *Open Systems Interconnection (OSI) – Service Definitions – Association Control Service Definition for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.218, *Open Systems Interconnection (OSI) – Service Definitions – Reliable Transfer: Model and Service Definition.*

– Recommendation X.219, *Open Systems Interconnection (OSI) – Service Definitions – Remote Operation: Model, Notation and Service Definition.*

– Recommendation X.225, *Open Systems Interconnection (OSI) – Protocol Specifications – Session Protocol Specification for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.226, *Open Systems Interconnection (OSI) – Protocol Specifications – Presentation Protocol Specification for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.227, *Open Systems Interconnection (OSI) – Protocol Specifications – Association Control Protocol Specification for Open Systems Interconnection for CCITT Applications.*

– Recommendation X.228, *Open Systems Interconnection (OSI) – Protocol Specifications – Reliable Transfer Protocol Specification for Open Systems.*

– Recommendation X.400, *Message handling systems: Message handling system and service overview.*

3 Definitions

Unless explicitly, all terms apply to the view of a system presented for the purpose of open systems interconnection. This implies that the terms relate to a DTAM rather than to any real documents in local system.

The definitions are grouped into major categories, and ordered alphabetically within each category.

For the purpose of T.430-Series Recommendations, the following definitions apply:

3.1 *DTAM service and protocol definitions*

The following definitions are applied to the series of Recommendations T.431 to T.433, in addition to the definitions defined in other T.400-Series Recommendations:

3.1.1 **document bulk transfer**

Bulk transmission of a document as a whole.

3.1.2 **document bulk transfer and manipulation**

An arbitrary combination of document bulk transfer and document manipulation.

3.1.3 **document manipulation**

Creation, deletion or modification of one or more constituents or substructures of a document.

3.1.4 **DTAM user**

That portion of the application entity which conceptually invokes the DTAM service.

3.1.5 **remote document access**

Document selection and access rights via communication.

3.1.6 **remote document management**

Document creation or deletion via communication.

3.1.7 **service element**

A unit of standardization specifying a complete group of functions.

3.1.8 **service primitive**

The smallest defined interaction between the user and the provider of a communication service.

3.2 *Reference model definitions*

T.430-Series Recommendations are based on the concept developed in Recommendation X.200 and make use of the following terms defined in it:

a) application-entity;

b) application-process;

c) application service element;

d) (N)-connection;

e) open system;

f) (N)-protocol;

g) (N)-protocol-control-information;

h) (N)-protocol-data-unit;

i) (N)-service;

j) (N)-service-access-point;

k) (N)-service-access-point-address;

l) (N)-service-data-unit;

m) (N)-user-data;

n) user element.

3.3 *Service convention definitions*

T.430-Series Recommendations make use of the following terms defined in Recommendation X.210 as they apply to the DTAM service:

a) confirm;

b) indication;

c) primitive;

d) request;

e) response;

f) service provider;

g) service user.

4 Abbreviations

Abbreviations defined in other Recommendations of the T.400-Series apply also to this Recommendation. T.430-Series Recommendations also use the following abbreviations:

ACSE	Association Control Service Element
APDU	Application Protocol Data Unit
ASE	Application Service Element
BT	Document Bulk transfer class
BTM	Document Bulk transfer and Manipulation class
DM	Document Manipulation class
MHS-SE	Message Handling System Service Element
OSI	Open Systems Interconnection
PSAP	Presentation Service Access Point
ROSE	Remote Operation Service Element
RTSE	Reliable Transfer Service Element
TPA	Telematic Protocol Architecture
M	Mandatory
O	Optional
*	At least one selection
–	Not permitted

5 DTAM for Telematic applications – General concepts

5.1 *The approach to the integrated Telematic application*

T.400-Series Recommendations specify the integrated approach for the Telematic application by defining the Document Transfer and Manipulation (DTAM) which is the common communication function for Telematic services located in the OSI application layer.

DTAM provides document handling facilities in order to realize document bulk transfer, document manipulation, document access and document management for various Telematic applications such as G4 facsimile, mixed mode, processable mode, Videotex, and so on.

5.2 *General communication functions*

DTAM provides the following general communication functions.

5.2.1 *Document bulk transfer*

This function is used to transfer a document from one system to another in an end-to-end communication. Two modes are defined to perform Document Bulk Transfer:

a) *Normal Mode*

Document bulk transfer is ensured in conjunction with the use of ACSE, RTSE and presentation.

b) *Transparent Mode*

DTAM protocol elements are directly mapped to the session layer. This mode is only applicable to facsimile Group 4 application.

5.2.2 *Remote document manipulations*

An operation can be applied to one or more constituents or a substructure of document and/or the application defined structures such as the operational structure. Operations applying to more than one constituent or a substructure are performed by applying the operation to each of the constituents or the substructures. The operations used by the application have to obey certain rules. Detail specification of the operational structure is described in Recommendation T.441.

5.2.2.1 *Operations for manipulations*

1) *Create operation*

The create operation effects the addition of a constituent to the document or to the application defined structure.

The create operation may carry the constituents, including the values applicable to the created constituent. If attributes are not set by the operation, they are set to their default values (if defined) or remain undefined otherwise. The relationship attributes of the superior are not implicitly modified by the create operation.

2) *Delete operation*

The delete operation provokes the deletion of the identified constituent and all subordinates. The relationship attributes of the superior constituents are not implicitly modified by the delete operation.

Note – If content portions are deleted as subordinates of either layout or logical structure, it is the responsibility of the application to ensure that they are also deleted for the complementary structure.

3) *Modify operation*

For the identified constituent, the modify operation assigns new values to the mentioned attributes. Attributes not mentioned in a modify operation remain unchanged. Identification attributes are used in a modify operation to identify the concerned constituent. They are set at the time of the creation of the object or content portion and remain unchanged by modify operations. Other invariable attributes must not occur in this operation.

Whenever applying one of the concerned operations, it is the responsibility of the application to ensure consistency of the document.

4) *Call operation*

The call operation is used to read an object of the Operational Structure which contains a sequence of DTAM protocol data unit which is applicable to the existing document.

5) *Rebuild operation*

The rebuild operation is for further study.

5.2.3 *Remote document access*

For further study.

5.2.4 *Remote document management*

For further study.

5.3 *Communication support functions*

DTAM makes use of the following services as a communication support function to exchange protocol elements between DTAM Protocol Machines (DTAM-PMs):

a) the service of session layer defined in Recommendation X.215 according to the rule of Recommendation T.62 *bis*;

b) the service of ACSE (Association Control Service Element) and the service of presentation layer;

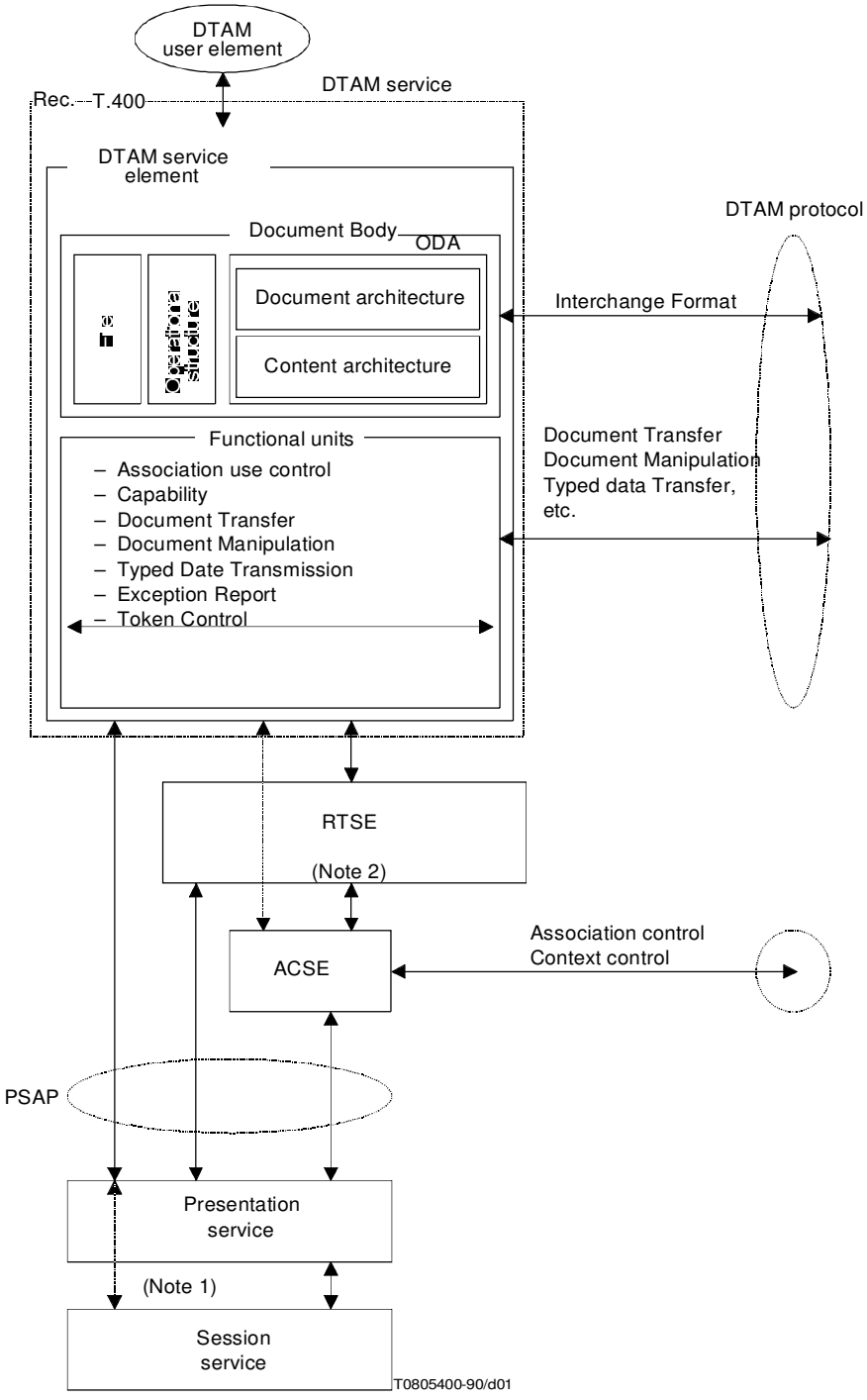
c) the service of RTSE (Reliable Transfer Service Element).

Note – The use of ROSE (Remote Operation Service Element) is left for further study.

5.4 *Telematic Protocol Architecture (TPA) model*

DTAM operates between two Telematic DTAM Protocol Machines (DTAM-PMs) in the application layer of OSI model. Protocol elements are exchanged between DTAM-PMs, using the service of session layer as defined in Recommendation X.215 according to T.62 *bis* rules, or the services of ACSE (Association Control Service Element), presentation layer services and RTSE (Reliable Transfer Service Element). Telematic Protocol Architecture (TPA) model is shown in Figure 1/T.431. The application layer protocol architecture illustrated in this figure is composed of ACSE, RTSE, DTAM application service element, and DTAM user elements.

Inclusion of ROSE element in TPA is left for further study.



Note 1 – In some applications, APDUs defined in DTAM are directly mapped to session service defined in Recommendation X.215.

Note 2 – The use of RTSE is only available for Bulk Transfer in normal mode.

FIGURE 1/T.431

A basic Telematic Protocol Architecture (TPA) model

5.5 *Intercommunication with other environment*

Intercommunication with MHS is for further study.

6 Overview of Recommendations T.431 to T.433

6.1 *T.431 introduction and general principles*

This Recommendation provides information about T.430-Series Recommendations as a whole by way of an introductory description of the DTAM service and protocol, an overview of each of the Recommendations and a description of their interdependencies. References necessary for all T.430-Series Recommendations are given, and terms used throughout all T.430-Series Recommendations are defined. Conformance to T.430-Series Recommendations is specified and rules for defining communication application profiles are given.

6.2 *T.432 DTAM service definition*

Recommendation T.432 defines in an abstract way the services provided by an application-service-element, the Document Transfer and Manipulation Service Element (DTAM) to support applications in a distributed Telematic systems environment.

6.3 *T.433 DTAM protocol specification*

Recommendation T.433 specifies the protocol for the services provided by an application-service-element, the Document Transfer and Manipulation Service Element (DTAM) to support applications in a distributed Telematic systems environment.

7 Application rules for communication application profiles

Specific communication application profiles may be defined using this T.430-Series Recommendations according to the rules defined in this section. Definition procedure of a communication application profile is summarized in Figure A–1/T.431.

7.1 *General principle*

Tables 1/T.431 and 2/T.431 define permissible combinations of a service class, communication support functions and functional units that may be used to define a communication application profile during the life time of association.

A communication application profile must specify

1) a service class;

2) functional units;

3) communications support functions

that are conforming to this Recommendation.

TABLE 1/T.431

Services associated with functional units

Functional unit		DTAM service	Service classes			Reference
			BT	DM	BTM	
U1	Association use control unit	Establishment	M	M	M	
		Termination	M	M	M	
		Abort	M	M	M	
U2	Capability unit	Capability	O	O	O	
U3	Document bulk transfer unit	Document bulk transfer	M	–	M	
U4	Document manipulation unit (unconfirmed)	Document unconfirmed manipulation Create, Delete, Modify, Call, Others for further study	–	M	M	
U5	Document manipulation unit (confirmed)	Document confirmed manipulation Create, Delete, Modify, Call, Others for further study	Further study			
U6	Typed data transmission unit	Typed data transfer	–	O	O	
U7	Token control unit	Token control	O	O	O	
U8	Exception report unit	Exception reporting	Further study	–	Further study	
U10	Remote document management unit	Further study	Further study			
U11	Remote document access unit	Further study	Further study			

TABLE 2/T.431

Summary of service classes

Service classes		DTAM communication support functions
Document bulk transfer (direct)	BT_0	Direct mapping to Session service (transparent mode)
	BT_1	ACSE and RTSE and Presentation service (normal mode)
Document manipulation	DM_1	ACSE and Presentation service
Document bulk transfer and manipulation	BTM	ACSE and RTSE and Presentation service (Note 2)
Remote document access (Note 2)	RDA	
Remote document management (Note 2)	RDM	

Note 1 – BT, DM, BTM, RDA and RDM are used to classify DTAM protocol architecture depending on the combination of communication support function.

Note 2 – These service classes are left for further study.

7.2 *Service class*

This Recommendation defines three service classes that are general communication functions provided by DTAM:

1) Document bulk transfer;

2) Document manipulation;

3) Document bulk transfer and manipulation.

Recommendations T.432 and T.433 define all DTAM services and procedures as application protocol that may be used in defining each service class. The application profile must specify the required service class depending on the DTAM application profile requirement.

7.3 *Functional units*

Table 1/T.431 defines permissible combinations of a service class and functional units. Functional units are used to simplify the procedure as the application protocol. Recommendations T.432 and T.433 define DTAM service and protocol that may be used in an application profile. This subsection defines the rules for using functional units within an application profile, as follows:

1) The communication application profile must specify all functional units conforming to a service class.

2) The communication application profile must specify all DTAM service primitives that are associated with functional units.

3) The communication application profile must specify all parameter sets that are associated with a DTAM service, these service primitives must include parameters that are classified as mandatory in the Recommendation T.432.

4) The communication application profile must specify value and default value of DTAM protocol data handled by a functional unit.

5) The communication application profile may specify or exclude the use of any DTAM service primitives that is classified as a user option in Recommendation T.432.

6) The communication application profile may specify as mandatory the use of any DTAM service primitives that is classified as a user option in Recommendation T.432.

7.4 *Communication support functions*

Table 2/T.431 defines permissible combinations of a service class and communication support functions. Recommendation T.433 defines DTAM protocol in conjunction with the Association Control Service Element (ACSE), the Reliable Transfer Service Element (RTSE) and Presentation service or Session service (see Recommendation X.215) according to the rule of Recommendation T.62 *bis*. This subsection defines the rules for using communication support functions within an application profile, as follows:

– The application profile must specify all communication support functions conforming to a service class.

7.5 *Use of communication application profile*

A single communication application profile is used for one association. The use of more than one communication application profile during the lifetime of association is for further study.

8 Service classes, functional units and communication support functions

Functional units and service classes are logical groupings of related DTAM services defined in Recommendation T.432.

8.1 *Service classes*

Recommendations T.432 and T.433 define all DTAM services and procedures as application protocol that may be used in defining each service class. Which functional units are mandatory and which are optional in each service class; document bulk transfer, document manipulation and document transfer and manipulation are shown in Table 1/T.431.

8.1.1 *Document bulk transfer class*

In terminal-to-terminal communications, there exist bulk document transfer applications transmitting documents as a whole, such as G4 facsimile and mixed-mode communications. In this document bulk transfer applications, a document generated at one system (terminal) is transmitted to another system (terminal).

The document bulk transfer class consists of

a) association use control functional unit;

b) optionally, capability functional unit;

c) document bulk transfer functional unit;

d) exception report functional unit (see Note);

e) optionally, token control functional unit.

Note – Use of exception report functional unit is for further study.

8.1.2 *Document manipulation class*

In Telematic document data base applications, parts of a document may be transferred to generate a whole document sequentially, concatenating parts stored in different resources. The only document manipulation class can be applied to this application. The document manipulation class consists of

a) association use control functional unit;

b) optionally, capability functional unit;

c) document manipulation functional unit (unconfirmed),

d) optionally, token control functional unit,

e) optionally, typed data transmission functional unit.

8.1.3 *Document bulk transfer and manipulation class*

In addition to document transfer applications, there exist conversational applications transmitting documents two-way interactively. This service class is achieved by an arbitrary combination of document bulk transfer and document manipulation. For example, in terminal-to-terminal communications, conversational applications include interactive Telematic services with handwriting and pointing, and interactive remote editing of previously transmitted documents. In host access applications, special characteristics of Document Architecture include the use of soft copy media. These enable partial document manipulations such as modification or deletion of portions of the structured document received from the host. In this application, document structure of a previously transmitted document may be manipulated.

Note – In host-to-terminal communications the structured document is transferred as a body part for submission, delivery, filing and retrieval. Applicability to other host-to-terminal communications, such as MHS, document filing and retrieval service, is left for further study.

The document bulk transfer and manipulation class consists of

a) association use control functional unit;

b) optionally, capability functional unit;

c) document bulk transfer functional unit;

d) optionally, exception report functional unit;

e) optionally, token control functional unit;

f) optionally, typed data transmission functional unit.

8.1.4 *Remote document access class*

For further study.

8.1.5 *Remote document management class*

For further study.

8.2 *Functional units*

8.2.1 *Association use control functional unit (Kernel)*

DTAM provides the trigger for the use of the association provided in ACSE, and controls association use during communication. Association use control unit supports basic DTAM services for unique discrimination of both AEs, selection of functional units, establishment, termination and abort of association use.

8.2.2 *Capability functional unit*

The DTAM capability functional unit provides the means for invocation or negotiation of application and communication characteristics during an association being in effect up to the next subsequent DTAM capability invocation.

8.2.3 *Data transmission functional units*

DTAM provides document transfer methods, such as document bulk transfer, document manipulation and typed data transmission. Data transmission unit consists of the following three units:

a) *Document bulk transfer functional unit*

DTAM has a function to transmit the document in bulk to the other DTAM under the communication environment negotiated by D-INITIATE service and additionally by D-CAPABILITY service. The documents represented by ODIF (Document Interchange Format) is transmitted using bulk document transfer unit.

b) *Document manipulation functional unit (confirmed or unconfirmed)*

In addition to the above bulk transfer, DTAM provides a function to partially modify a document by generating, revising or deleting structures of an existing document. The DTAM user uses this document manipulation unit to manipulate structures in an existing document.

c) *Typed data transmission functional unit*

In host-access applications, data sent to the host by the user are fundamentally unstructured retrieval commands and interrupts such as transmission stop requests. The DTAM has a function to pass such data directly on to the DTAM user as typed data. Typed data transmission unit transmits commands for document filing, document retrieval and interrupt without subjecting to token control.

8.2.4 *Session management functional unit*

The DTAM has control functions for conversational control provided by the session layer.

– Token control functional unit

Transmission rights required for document transfer and document manipulations are controlled with token control unit.

8.2.5 *Exception report functional unit*

For further study.

8.2.6 *Remote document access functional unit*

For further study.

8.2.7 *Remote document management functional unit*

For further study.

8.3 *Communication support functions*

This subsection defines permissible combinations of a service class and communication support functions. Valid combinations of service classes and communication support functions are summarized in Table 2/T.431. Recommendations T.432 and T.433 define DTAM services and procedures that specify two communication support functions: the Association Control Service Element (ACSE) service, the RTSE and the Presentation service (see Recommendation X.216) or Session service (see Recommendation X.215) according to the rule of Recommendation T.62 *bis*. Other communication support functions such as ROSE element are left for further study.

8.3.1 *Document bulk transfer class*

a) *Use of Recommendation T.62 bis (BT_0)*

Application Protocol Data Units (APDU) defined in DTAM are directly mapped to Session service defined in Recommendation X.215 according to the rule of Recommendation T.62 *bis*.

b) *Use of ACSE, RTSE and Presentation layer services (BT_1)*

Other Telematic document bulk transfer service classes may be provided in conjunction with the ACSE (see Recommendation X.217), the RTSE (see Recommendation X.218) and the Presentation service (see Recommendation X.216).

Note – It is the responsibility of the DTAM implementors to make sure that the "session requirements" parameter in the A-ASSOCIATE request primitive will contain the appropriate value to select Session Capability Data FU.

8.3.2 *Document manipulation class*

– Use of ACSE and Presentation layer services (DM_1)

The Telematic document manipulation service classes may be provided in conjunction with the ACSE (see Recommendation X.217), and the Presentation service (see Recommendation X.216).

8.3.3 *Document bulk transfer and manipulation class*

– Use of ACSE, RTSE and Presentation layer services (DM_1)

Telematic document bulk transfer and manipulation service classes may be provided in conjunction with the ACSE (see Recommendation X.217), the RTSE (see Recommendation X.218) and the Presentation service (see Recommendation X.216).

8.3.4 *Remote document access class (RDA)*

For further study.

8.3.5 *Remote document management class (RDM)*

For further study.

ANNEX A

(to Recommendation T.431)

Summary of the definition procedure of a communication application profile

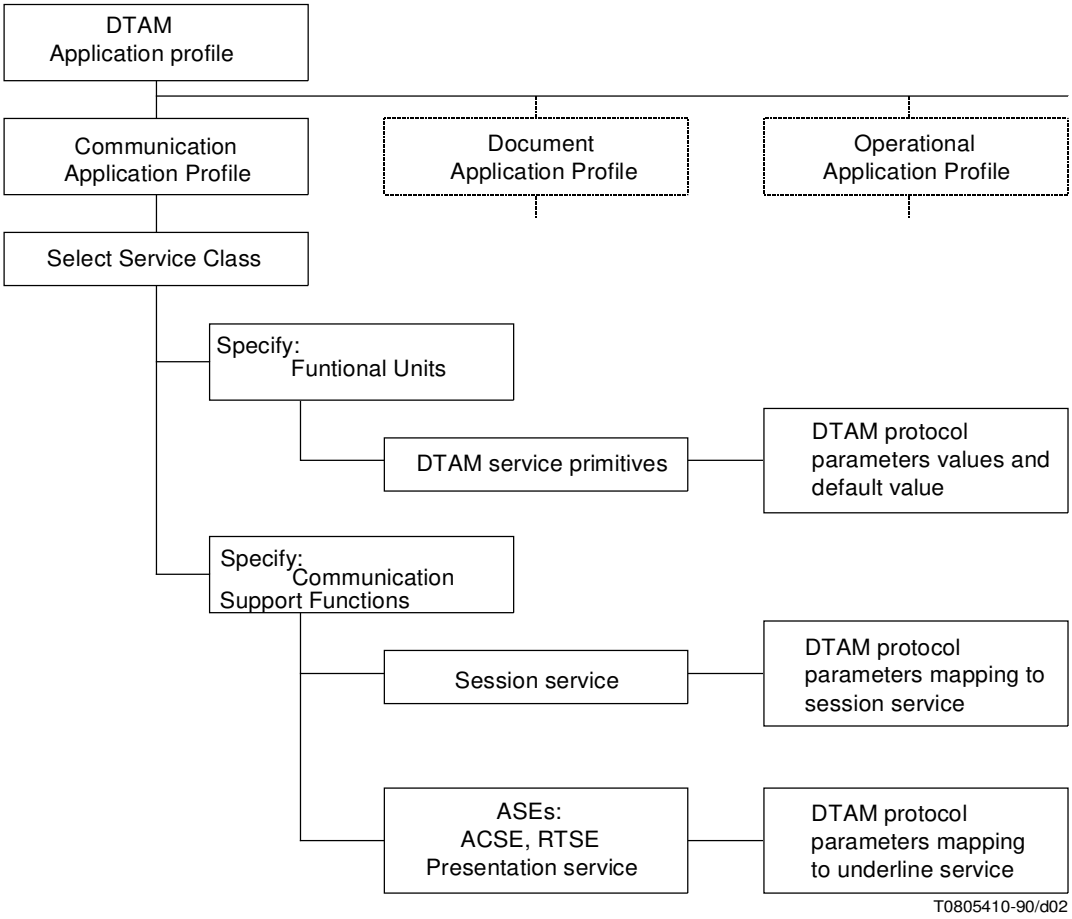


FIGURE A-1/T.431

Defining procedure of communication application profile