INTERNATIONAL TELECOMMUNICATION UNION

ITU-T Q.500

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STANDARDIZATION SECTOR
OF ITU

DIGITAL EXCHANGES

DIGITAL LOCAL, COMBINED, TRANSIT AND INTERNATIONAL EXCHANGES – INTRODUCTION AND FIELD OF APPLICATION

ITU-T Recommendation Q.500

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation Q.500 was published in Fascicle VI.5 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

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

Recommendation Q.500

DIGITAL LOCAL, COMBINED, TRANSIT AND INTERNATIONAL EXCHANGES
INTRODUCTION AND FIELD OF APPLICATION

1 Introduction

This series of Recommendations Q.500-554 applies to digital local, combined[1], transit and international exchanges for telephony in Integrated Digital Networks (IDNs) and mixed analogue/digital networks, and also to local, combined, transit and international exchanges in an Integrated Services Digital Network (ISDN).

The series of Recommendations comprises:

Q.500 Introduction and field of application
Q.511 Exchange interfaces towards other exchanges
Q.512 Exchange interfaces for subscriber access
Q.513 Exchange interfaces for operations, administration and maintenance
Q.521 Exchange functions
Q.522 Digital exchange connections, signalling and ancillary functions
Q.541 Design objectives – General
Q.542 Design objectives – Operations and Maintenance
Q.543 Performance design objectives
Q.544 Exchange measurements
Q.551 Transmission characteristics of digital exchanges
Q.552 Transmission characteristics at 2-wire analogue interfaces
Q.553 Transmission characteristics at 4-wire analogue interfaces
Q.554 Transmission characteristics at digital interfaces.

Considerations have been primarily on exchanges utilizing, at least in part, time division switching techniques. However, these Recommendations are implementation independent, and other system implementations using alternative techniques (e.g., space division switching) may be possible, which would meet the requirements of these Recommendations.

2 Field of application

These Recommendations are intended to be applied as indicated below.

2.1 *Application and evolution to the ISDN*

The selection of features, functions and interfaces to be provided in a digital local, combined, transit or international exchange in a particular network application will be determined by the administration concerned. Reference to a function in these Recommendations, including their diagrams, does not imply that it will necessarily be provided in every exchange type or configuration. Similarly, it is possible that some functions may be provided which are not mentioned.

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[1] A "combined" digital exchange is one which includes both local exchange and transit exchange functions (see definition 1005 in Recommendation Q.9).

2.2 *Relationship of design performance requirements to operational performance requirements*

Performance requirements as defined in this series of Recommendations should be considered as design objectives for systems under the conditions stated in the Recommendations. These conditions are defined by such parameters as average circuit occupancy, busy hour call attempts, etc. They should be distinguished from the operational performance requirements which administrations establish for exchanges operating in their particular environment.

Further clarification of this point can be obtained in Recommendation G.102.

3 The Q.500-Series of Recommendations

3.1 *Exchange interfaces (Recommendations Q.511, Q.512 and Q.513)*

The interface functions defined are those necessary for interworking with digital and analogue transmission systems on both circuits to other exchanges and on subscriber lines, and with telecommunications management networks.

3.1.1 *Characteristics of exchange interfaces towards other exchanges (Recommendation Q.511)*

This Recommendation describes the exchange interfaces used to provide transmission facilities towards other exchanges. It applies to digital local, combined, transit and international exchanges for telephony in integrated digital networks (IDN) and mixed (analogue/digital) networks, and also to local, combined, transit and international exchanges in an integrated services digital network (ISDN).

3.1.2 *Characteristics of exchange interfaces for subscriber access (Recommendation Q.512)*

The Recommendation describes the subscriber side interface characteristics. It applies to digital local and combined exchanges for telephony in Integrated Digital Networks (IDN) and mixed (analogue/digital) networks, and also to local and combined exchanges in an integrated digital network (ISDN).

3.1.3 *Exchange interfaces for operations, administration and maintenance (Recommendation Q.513)*

The interfaces defined are those necessary for transmission of messages associated with operations, administration and maintenance of the exchange.

These interfaces include OAM interfaces between the exchange and the following: OAM systems, mediation devices, user workstations, and other network elements.

3.1.4 *Interfaces to non-voice handling facilities*

The need for the Recommendation of interfaces between digital transit, local and combined exchanges and non-voice handling facilities remains for further study. (An example of such a non-voice facility is a packet switched data node.) Attention is drawn to Recommendation X.300 which describes the general principles for interworking between public data networks and also to the I.400/I.500-Series Recommendations for interworking between ISDN and other dedicated networks.

3.2 *Exchange functions (Recommendation Q.521)*

This Recommendation covers the definition of the principal exchange functions to support services and includes a description of an exchange functional model.

3.3 *Exchange connections, signalling and ancillary functions (Recommendation Q.522)*

This Recommendation covers the following functions:

a) *Connections through an exchange*

This section includes the switch block(s), the characteristics associated with connections through exchanges and a set of diagrams showing typical types of connection.

A connection through an exchange may include one or more stages of time and/or space division switching, providing a path for transmission through the exchange.

b) *Signalling*

Signalling includes reception of call-related and other information, interaction with the call control function and transfer of information to subscribers and network(s) as required.

Signalling may involve common channel and/or channel associated signalling.

c) *Control and call handling*

Control and call handling includes initiation, supervision and termination of most actions in the exchange.

Commands are initiated and information passed/received to/from the other functions within the exchange.

Control functions may be contained in one block or distributed throughout the exchange.

d) *Ancillaries*

Examples of such functions are:

– recorded announcements;

– tone generation;

– conferencing facilities.

Their location is dependent on the function itself and the exchange configuration.

3.4 *Exchange design objectives (Recommendations Q.541, Q.542, Q.543 and Q.544)*

3.4.1 *General design objectives (Recommendation Q.541)*

This includes the general design objective principles, availability and hardware design objectives as well as the design objectives associated with the operation of an exchange in an Integrated Digital Network. The latter encompasses timing and synchronization design objectives.

Timing comprises the generation and distribution of timing signals and includes timing of outgoing signals. It enables those parts of the exchange which form the switched path of a connection to operate synchronously. Synchronization will depend on the national synchronization plan and exchange timing arrangements.

Exchanges will usually extract synchronizing information from one or more incoming bit streams or a separate synchronization network and use this to adjust the timing signals generated in the distribution within the exchange.

3.4.2 *Operations and maintenance design objectives (Recommendation Q.542)*

This covers the operations and maintenance design objectives including network management controls, alarm handling and subscriber line maintenance and testing.

3.4.3 *Performance design objectives (Recommendation Q.543)*

Exchange performance design objectives are defined for guiding system design and for comparing the capabilities of different systems. (Recommendations relating to provisioning and operational performance of exchanges in the network are covered in the E.500-E.543 Series.)

3.4.4 *Exchange measurements (Recommendation Q.544)*

Measurements that may be used for planning, operation, maintenance and network management of exchanges and their associated networks are described. The measurement data consists primarily of event counts and traffic intensity levels experienced by the various traffic handling elements of the exchange.

3.5 *Transmission characteristics (Recommendations Q.551 to Q.554)*

3.5.1 *Transmission characteristics of digital exchanges (Recommendation X.551)*

This includes the general definitions associated with Recommendations Q.551 to Q.554, and transmission parameters from a total exchange perspective such as absolute group delay and the transfer function for jitter and wander. These Recommendations define, for any connection which may be set up by a local, combined, transit or international exchange, the necessary levels of transmission performance to conform with overall objectives for the complete user-to-user connections in which the exchange may be involved.

3.5.2 *Transmission characteristics at 2-wire interfaces (Recommendation Q.552), 4-wire interfaces (Recommendation Q.553) and digital interfaces (Recommendation Q.554)*

These cover the detailed transmission characteristics of the various types of interface that may be provided on a digital exchange.