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1. GENERAL

This recommendation describes the elements and functions of the signalling information used by the Transaction Capabilities protocol. The encoding of these elements and the format of the messages are outlined in Recommendation Q.773. Their application in the Transaction Capabilities signalling procedures is described in Recommendation Q.774.

2. INTRODUCTION

The Transaction Capabilities protocol format is separated into two portions, namely Transaction and Component. The Transaction Portion identifies whether the Transaction Capabilities Application Part (TCAP) transaction is expected to consist of single or multiple messages and provides a means to associate these messages with a specific Application Process transaction.

The Component Portion consists of one or more Components as specified in Recommendation Q.773.

The first field of every element encoded in accordance with Recommendation X.409 contains a data type identifier. The general format for naming this field is

element_name "IDENTIFIER"

When the element-name itself contains the word "identifier" or "ID" (e.g., Transaction ID) this rule will result in a field name that repeats the word "identifier", (e.g., Transaction ID Identifier).

3. TRANSACTION PORTION

3.1 Package Type Identifier. The messages required for TCAP interactions between two signalling nodes are identified in the Package Type Identifier and are as follows:

3.1.1 Unidirectional. A message with this Package Type sends information in one direction only with no reply expected. No TCAP Transaction is established.

3.1.2 Query With Permission. A message with this Package Type initiates a TCAP transaction and informs the destination node (i.e., the node that receives the message) that it may end the TCAP transaction.

3.1.3 Query Without Permission. A message with this Package Type initiates a TCAP transaction and informs the destination node that it may not end the TCAP transaction.

3.1.4 Response. A message with this Package Type ends the TCAP transaction.

3.1.5 Conversation With Permission. A message with this Package Type is the continuation of a TCAP transaction and informs the destination node that it may end the TCAP transaction.

3.1.6 Conversation Without Permission. A message with this Package Type is the continuation of a TCAP transaction and informs the destination node that it may not end the TCAP transaction.

3.2 Total TCAP Message Length. This is the total octet length of the overall TCAP message. It does not include itself or the Package Type Identifier.

An asterisk '*' indicates a change from the CCITT Red Book, Vol. VI, that is specific to U.S. Networks.

A bar '|' indicates a change from Issue 1 of Bell Communications Research Specification of Signalling System Number 7, Vol. 1 and 2.

3.3 Transaction ID Identifier. This indicates that the Transaction ID(s) follows.

3.4 Length of Transaction IDs. This is the total octet length which is required by the Transaction IDs in the TCAP message. It is the combined length of the Originating and Responding Transaction IDs when present. It does not include itself or the Transaction ID Identifier.

3.5 Transaction IDs. A Transaction ID is a reference identifier which is used to associate all TCAP messages within an Application Process transaction. It is of local significance only.

3.5.1 Originating Transaction ID. This is the Transaction ID assigned by the originator.

3.5.2 Responding Transaction ID. This is the Originating Transaction ID that was received in the message for which the response is generated.

3.6 Component Sequence Identifier. This indicates that a sequence of one or more Components follows and they are to be processed in the order received.

3.7 Component Sequence Length. This is the total octet length of the Component(s) contained in the Component Portion of the TCAP message. It does not include itself or the Component Sequence Identifier.

4. COMPONENT PORTION

4.1 Component Type Identifier. The Component Types that can be used are as follows:

4.1.1 Invoke (Last). This is used to invoke an operation (such as requesting a database to perform digit translation).

When the Invoke Component contains a Correlation ID, "Last" indicates no further responding Components.

When the Invoke Component does not contain a Correlation ID, it is always coded "Last".

4.1.2 Return Result (Last). This is used to return the results of an invoked operation. "Last" indicates that no further responding Components are expected.

4.1.3 Return Error. This reports the unsuccessful completion of an invoked operation.

4.1.4 Reject. This reports the receipt and rejection of an incorrect Component other than another Reject Component.

4.1.5 Invoke (Not Last). This is similar to the Invoke described in Section 4.1.1 except that further responding Components are expected.

4.1.6 Return Result (Not Last). This is similar to the Return Result described in Section 4.1.2 except that further responding components are expected.

4.2 Component Length. This is the total octet length of the Component specified in the Component Type Identifier. It does not include itself or the Component Type Identifier.

4.3 Component ID Identifier. This indicates that the Component ID(s) follow.

4.4 Component ID Length. This indicates the total octet length of the Component IDs when present. It does not include itself or the Component ID Identifier.

4.5 Component IDs. A Component ID is a reference identifier which labels the Component within a TCAP transaction. These allow correlation of Invokes and Responses.

4.5.1 Invoke ID. This is the Component ID assigned by the originator.

4.5.2 Correlation ID. This is the Invoke ID that was received in the Component for which the response is generated.

4.6 Operation Code Identifier.

> This indicates that the Operation Code follows.

4.6.1 National. This indicates that the Operation Code is defined in this series of recommendations.

4.6.2 Private. This indicates that the Operation Code is defined within network specific TCAP applications. The structure of the Operation Code parallels National TCAP.

4.7 Operation Code Length. This is the total octet length of the Operation Code. It does not include itself or the Operation Code Identifier.

4.8 Operation Code. This code indicates an Operation Family and a Specifier to identify a specific operation within the family. It also specifies whether a reply is expected and whether the operation is defined for intranetwork or national use. The families and associated Specifiers are as follows.

4.8.1 Parameter. This indicates that the following operation on Parameters is to be performed.

  a) Provide Values. This Specifier indicates that the value of the Parameters identified in the Parameter Set are to be provided. Specific Parameters are for further study.

  b) Set Value. This Specifier indicates that the value of the Parameters identified in the Parameter Set are to be set. Specific Parameters are for further study.

4.8.2 Charging. This indicates that the following charging operation is to be performed.

  a) Bill Call. This Specifier indicates that a billing record should be made.

4.8.3 Provide Instructions. This request instructions according to the service script.

  a) Start. This Specifier initiates the interpretation of the service script.

  b) Assist. An Assist is used when a node that currently has control of a call requires the use of a resource (e.g., Announcement System) that it does not have. The call is passed to another node that does have the resource. The second node detects (in a network specific manner) that the call is one on which it is to provide an assist, and requests instruction from the database with this Specifier.

4.8.4 Connection Control. This indicates that the Connection Control Operation identified in the Specifier is to be performed.

  a) Connect. This Specifier indicates that the connection is to be established using the given called address and any other needed information.

  b) Temporary Connect. This Specifier is identical to "Connect" except that a "Forward Disconnect" (see d) will follow. It is used to establish an "Assist".

  c) Disconnect. This Specifier indicates that the connection is to be terminated.

  d) Forward Disconnect. This Specifier informs a node that it may discontinue its "Temporary Connect" to another node. It is used to terminate an "Assist".

4.8.5 Caller Interaction. This instructs the exchange to interact with the caller as indicated in the Specifier.

  a) Play Announcement. This Specifier identifies which announcement is to be played to the caller. Different announcements may be provided by specifying the relevant announcement identifier (e.g., including announcements in other languages).

  b) Play Announcement and Collect Digits. This Specifier is identical to "Play Announcement" with the addition of digit collection from the caller.

4.8.6 Send Notification. This indicates that a notification of an event (such as call completion confirmation) is to be sent. Specifiers of this Family are for further study.

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4.8.7 Network Management. This Family caters to Network Management operations.

a) Automatic Call Gap. This Specifier initiates selective inhibiting of calls for a given period of time.

4.8.8 Procedural. This indicates that the procedure identified in the Specifier is to be performed.

a) Temporary Handover. This Specifier informs the receiving node that a temporary handover is in progress and on completion it may release all transaction resources.

4.8.9 Miscellaneous. A general Operation Family that does not fit under the preceding headings. Specifiers are for further study.

4.9 Error Code Identifier. This indicates that the Error Code follows.

4.9.1 National. This indicates that the Error Code is defined in this series of recommendations.

4.9.2 Private. This indicates that the Error Code is defined within network specific TCAP applications. The structure of the Error Code parallels National TCAP.

4.10 Error Code Length. This is the total octet length of the Error Code associated with a failed operation. It does not include itself or the Error Code Identifier.

4.11 Error Code. This provides the reason why a specific operation could not be completed successfully. An error that resulted in the unsuccessful completion of an operation may be identified for either national or private use. The national errors are as follows.

a) Unexpected Component Sequence. An incorrect sequence of Components was received (e.g., "Disconnect" followed by "Play Announcement").

b) Unexpected Data Value. The data value was not as expected (e.g., routing number expected but billing number received).

c) Unavailable Network Resource. A network resource (such as Announcement System) was not available for the requested operation.

d) Missing Customer Record. A customer record could not be located.

e) Reply Overdue. A predetermined time limit has been exceeded for the receipt of a reply to a requested operation.

f) Data Unavailable. The data identified in the requested operation was unavailable.

4.12 Problem Code Identifier. This indicates the class of problem that caused a Component of Transaction Portion to be rejected.

4.13 Problem Code Length. This is the total octet length of the Problem Code associated with the rejection of a Component or Transaction Portion. It does not include itself or the Problem Code Identifier.

4.14 Problem Code. This indicates the specific reason why a Component or Transaction Portion had to be rejected. The Problem Code is partitioned into a Problem Type followed by a Problem Specifier associated with each Problem Type. The Problem Types and Specifiers for which a Component or Transaction Portion is rejected are classified as follows.

4.14.1 General. A problem of a general nature.

a) Unrecognized Component. The Component Type has not been defined.

b) Incorrect Component Portion. An unexpected or undefined identifier within the Component Portion.

c) Badly Structured Component Portion. A fundamental encoding problem (e.g., bad length).

4.14.2 Invoke. A problem specific to an Invoke Component.

a) Duplicate Invoke ID. An Invoke ID is received which has already become assigned to another operation in progress.

b) Unrecognized Operation Code. The operation has not been defined by the Application Process.

c) Incorrect Parameter. An unexpected or undefined Parameter was received.

d) Unrecognized Correlation ID. The received Correlation ID does not reflect an operation that is currently in progress.

4.14.3 Return Result. A problem specific to a Return Result Component.

a) Unrecognized Correlation ID. The received Correlation ID does not reflect an operation that is currently in progress.

b) Unexpected Return Result. The invoked operation does not report success.

c) Incorrect Parameter. An unexpected or undefined Parameter (result) was received.

4.14.4 Return Error. A problem specific to a Return Error Component.

a) Unrecognized Correlation ID. The received Correlation ID does not reflect an operation that is currently in progress.

b) Unexpected Return Error. The Return Error Component did not report failure of the invoked operation.

c) Unrecognized Error. The reported error has not been defined by the Application Process.

d) Unexpected Error. The reported error is not applicable to the invoked operation.

e) Incorrect Parameter. An unexpected or undefined Parameter was received.

4.14.5 Transaction Portion. A problem specific to the Transaction Portion.

a) Unrecognized Package Type. The Package Type has not been defined.

b) Incorrect Transaction Portion. An unexpected or undefined identifier was received within the Transaction Portion.

c) Badly Structured Transaction Portion. A fundamental encoding problem (e.g., bad length).

d) Unrecognized Transaction ID. The received Transaction ID does not reflect a transaction currently in progress.

4.15 Parameter Set Identifier. This indicates that the Parameter Set follows.

4.16 Parameter Set Length. This is the total octet length of the Parameter Set. It does not include itself or the Parameter Set Identifier.

5. PARAMETERS

The Parameters associated with the Component Portion of a TCAP message are defined as follows:

a) Parameter Identifier which uniquely identifies the specific Parameter that follows.

b) Parameter Length which provides the total octet length of the specified Parameter but does not include itself or the Parameter Identifier.

c) Parameter Contents which is the actual values of the Parameter described by the Parameter Identifier.

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5.1 Automatic Call Gap (ACG) Indicators. These indicate the cause for applying an ACG control, also the time duration for the ACG control to be in effect and the time interval between ACG application.

5.1.1 Control Cause. This indicates the reason that ACG control is being initiated.

    a)   Vacant Code. Calls are being received for an unassigned code.

    b)   Out-of-Band. Calls are being received for a band that a customer has not subscribed.

    c)   Database Overload. The database is overloaded.

    d)   Destination Mass Calling. An excessive number of calls are being received for a destination.

    e)   Operation Support System (OSS) Initiated. The ACG control has been externally initiated by an Operation Support System.

5.1.2 Duration. This indicates the time duration that an ACG control should be applied.

5.1.3 Gap. This indicates the time interval between applications of the ACG control. It also allows the ACG control to be cancelled.

5.2 Standard Announcement. This indicates one of the following Standard announcements.

    a)   Out-of-Band. Customer has not subscribed to this band.

    b)   Vacant Code. Unassigned code.

    c)   Disconnected Number. The called number has been disconnected.

    d)   Reorder (120 IPM). All trunks are busy.

    e)   Busy (60 IPM). The called number is busy.

    f)   No Circuit Available. There is no circuit available to the called number.

5.3 Customized Announcement. This indicates an announcement that is not standard.

5.4 Digits. This provides information on the number of digits that follow, type (e.g., called party), nature (e.g., National), Numbering Plan (e.g., telephony) and encoding method (e.g., BCD).

5.4.1 Type of Digits.

    a)   Dialled (called). The customer dialled digits.

    b)   ANI (calling). The ANI information of the calling number.

    c)   Caller Interaction. The digits dialled by the caller after request for interaction.

    d)   Routing Number. The digits are associated with network routing.

    e)   Billing Number. The digits contain billing information.

    f)   Destination Number. The digits identify the destination number for the call.

    g)   Local Access and Transport Area (LATA). The digits identify the LATA.

    h)   Carrier. The digits identify the carrier.

5.4.2 Nature of Number. This provides additional information on the "Type of Digits" (e.g., International). The information to be provided is for further study.

5.4.3 Numbering Plan. This indicates the numbering plan associated with the digits.

    a)   ISDN Numbering Plan (Recommendation E.164)

    b)   Telephony Numbering Plan (Recommendation E.163)

    c)   Data Numbering Plan (Recommendation X.121)

    d)   Telex Numbering Plan (Recommendation F.69)

    e)   Maritime Mobile Numbering Plan (Recommendation E.120, 211)

    f)   Land Mobile Numbering Plan (Recommendation E.212, 213)

5.4.4 Encoding. This indicates the digits encoding scheme.

    a)   Binary Coded Decimal (BCD).

5.4.5 Number of Digits. This indicates in binary the number of digits that follow.

5.4.6 Digit Representation. Provision is made to represent digits encoded as specified in Section 5.4.4.

5.5 Standard User Error Code. The unsuccessful completion of a TCAP Transaction may be due to user error. The Standard User Errors are as follows.

    a)   Caller Abandon. The caller hangs up prior to completion of the TCAP Transaction.

    b)   Improper Caller Response. The caller responded incorrectly during "Caller Interaction".

5.6 Problem Data. This indicates the specific data that caused the problem in a TCAP Transaction.

5.7 SCCP Calling Party Address. This specifies the SCCP Calling Party Address to be used by the receiving node of a Temporary Handover (see Recommendation Q.774 Section 4.1). The address consists of one or any combination of the following elements.

    a)   Signalling Point Code

    b)   Global Title (e.g., dialled digits)

    c)   Subsystem Number (e.g., SCCP user)

5.8 Transaction ID. This specifies the Transaction ID to be used by the receiving node of a Temporary Handover. (See Recommendation Q.774 Section 4.1).

5.9 Package Type. This specifies the Package Type to be used by the receiving node of a Temporary Handover. (See Recommendation Q.774 Section 4.1).

5.10 Service Key. This specifies the Parameters that should be used to access the record.