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## **Error handling for the Directory**

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## Foreword

ETSI Technical Reports (ETRs) are informative documents resulting from ETSI studies which are not yet appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as are ETS or I-ETS.

This has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI). More specifically, it is the result of a joint effort of experts from the European Workshop for Open Systems (EWOS) EGDIR and ETSI STC-TE6 (Directory systems). Due to the similarity of objectives, EWOS and ETSI have agreed to issue common texts. The EWOS equivalent to this ETR is known as EWOS Technical Guide (ETG) 017.

NOTE: Since this ETR is identical to that of ETG 017, the document does not follow the normal presentation of an ETSI deliverable for this edition.

This ETR presents error conditions that may be encountered in Directory System Accesses (DSAs), and maps them onto Directory errors, depending on the circumstance in which they are encountered.

This ETR is intended to clarify the base standards and to assist implementors in determining which errors to use under a range of circumstances.

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## Introduction

Although the Directory standards define the semantics of return-error protocol data units, the mapping of particular error conditions to the defined protocol is not always clear.

This ETR provides a recommended mapping of error situations which may be encountered, to ROSE Rejects, or to the errors provided in the DAP and DSP protocols by the Directory Documents.

Error situations are defined by the combination of:

symptom - that is, the manner in which the error was detected (this may occur in several situations);

situation - that is, the circumstance or phase during which the error was detected.

For each such combination, error-handling recommendations are provided.

## 1 References

X.511: "The Directory - Access and System Services Definition (ISO 9594/3)".

X.518: "The Directory - Procedures for Distributed Operation (ISO 9594/4)".

A/DI1: "Directory Access".

A/DI2: "Directory System Access".

A/DI31: "Behaviour of DUAs for Distributed Operations".

A/DI32: "Behaviour of DSAs for Distributed Operations".

## 2 Symptoms

This clause describes a set of symptoms (not necessarily exhaustive). Each is identified by a title for reference later in the clause; this title is not intended to imply any particular usage in a particular implementation.

### E\_ACCESS

The initiator has insufficient access rights to carry out this operation.

### E\_ADMIN\_LIMIT

The Directory has reached some limit set by an administrative authority, and no partial results are available to return to the user. Examples of administrative limits are:

too many RDNs in a DN;  
too many changes in a modify-entry;  
too many attributes in a list of attributes or attribute types;  
too many elements in a filter.

### E\_ALIAS\_DEREF

An alias has been encountered while a previous alias was being de-referenced, or a name contained an alias plus one or more additional RDNs when the dontDereferenceAliases service control was being used, or the name supplied in an operation that precluded alias de referencing contained an alias plus one or more additional RDNs.

#### E\_ALIAS\_LOOP

During a whole-subtree search operation, an alias has been encountered which would lead to a loop (i.e. the alias points to an entry which is superior to entries which have already been evaluated in carrying out the search).

#### E\_ALIAS\_PROBLEM

An Alias has been encountered, but the entry to which it points does not exist.

#### E\_ARG\_BOUNDS

The argument does not comply with pragmatic constraints (defined locally or by functional standards).

#### E\_ARG\_SYNTAX

An operation argument either has incorrect ASN.1 syntax, or it has correct ASN.1 syntax but it does not conform with the syntax as defined in the Directory Documents.

NOTE 1: Within Bind Argument, additional elements are permitted, to allow future extensions, and do not create an error situation.

NOTE 2: Errors within attribute values are not included in this codification (see E\_ATT\_SYNTAX).

#### E\_ARG\_VIOL

An operation argument has correct syntax, but it violates additional rules and constraints laid down by the Directory Documents (such as the use of a Priority integer value whose meaning is undefined).

NOTE 1: Within a Relative Distinguished Name, having two AVAs of the same attribute type is an error which is covered by E\_DN, and not by E\_ARG\_VIOL.

NOTE 2: Errors within attribute values are not included in this codification (see E\_ATT\_SYNTAX).

#### E\_ATT\_BOUNDS

An attribute value does not comply with bounds specified either by the Directory Documents, or by functional standards.

#### E\_ATT\_OR\_VALUE\_EXISTS

Within an entry, an attribute or attribute value already exists, causing an error situation.

#### E\_ATT\_VALUE

Either an attribute value either has incorrect ASN.1 syntax, or, although of correct ASN.1 syntax, does not comply with the ASN.1 syntax defined by the attribute type, or is not compliant with other rules (e.g. a non-ISO 3166 country name encoding).

Among these rules could be a rule that a distinguished name is not permitted within an attribute-value assertion within a value of distinguished-name-syntax.

NOTE: The latter is not outlawed at present by EWOS Functional Standards.

#### E\_AUTHENTICATION

The authentication offered does not match that required by the object being authenticated.



#### E\_BUSY

The DSA is unable to handle this operation at this time (but it may be able to do so after a short while).

#### E\_CHAIN

The DSA must use chaining to carry out this operation, but is prohibited from doing so by Service Controls.

#### E\_CREDENTIALS

The credentials offered do not match those of the object with which authentication is taking place.

#### E\_DBE

An inconsistency has been detected in the DSA's data base, which may be localised to a particular entry or set of entries.

#### E\_DN

A DN contains an RDN with two AVAs of the same attribute type, or contains an RDN with zero AVAs.

#### E\_DSA

A DSA to which chaining is taking place is unable to respond.

#### E\_ENTRY\_EXISTS

An entry of the given name already exists, causing an error.

#### E\_EXTENSION

The DSA was unable to satisfy a request because one or more critical extensions were not available.

#### E\_ILLEGAL\_ROOT\_OBJECT

Root's DN has been supplied as the object of a Read, Compare, AddEntry, RemoveEntry, ModifyEntry, ModifyRDN, or as the BaseObject of a single-level search.

#### E\_ILLEGAL\_ROOT\_VALUE

Root's DN has been supplied illegally as an attribute value (e.g. as an AliasedObjectName).

#### E\_LOOP

The Directory is unable to accomplish the request due to an internal loop.

#### E\_MATCH

The attribute specified does not support the required matching capability.

#### E\_MISSING\_OBJECT\_CLASS

When creating an entry, the entry does not possess an object class.

#### E\_MULTI\_DSA

The operation is an update operation which affects other DSAs.

E\_NAMING\_VIOLATION

The name of the new or modified entry is incompatible with its object class or structure-rule.

E\_NO\_SUCH\_ATT

The specified attribute has not been found.

E\_NO\_SUCH\_OBJECT

The specified entry has not been found.

E\_NO\_SUCH\_VALUE

The specified attribute value has not been found.

E\_NON\_LEAF\_OPERATION

The operation being attempted is illegal except on a leaf.

E\_NONNAMING\_ATTRIBUTE

In either an add-entry or a modify-RDN operation, an attribute is included in the last RDN that is not a valid naming attribute according to the DIT structure rules locally applicable.

E\_NOT\_SINGLE\_VALUED

An attribute, registered as single-valued, is found at the conclusion of a modify operation (add-entry, modify-entry or modify-RDN) to possess more than one value. Such an error would occur, for example, when a second value has been added to the single-valued country-name attribute.

This error would not occur when a second value has been added to such an attribute, followed by removal of a value, all within the same modify operation. This transient situation should be tolerated by implementations, since the attribute conforms to requirements at the end of the operation. (A similar situation occurs when the first and only value is removed and a second value is subsequently added within a single modify operation; although the attribute at one stage of the processing is left with no values, at the end of the operation it possesses at least one value, as required. this transient situation should also be tolerated by implementations.) See also under E\_ZERO\_VALUES.

E\_OBJECT\_CLASS\_MOD

An (illegal) attempt has been made to alter or remove an object class attribute.

E\_OBJECT\_CLASS\_VIOL

There is a schema violation (e.g. missing mandatory attribute, or non-allowed attribute present).

E\_REFERENCE

An erroneous reference has been detected (e.g. DSA cannot handle name even as far as the number of RDNs that have already been resolved).

E\_REM\_NAMING\_ATT

An attempt has been made in a modify entry to remove a naming attribute or the distinguished value.

E\_SCOPE

No referrals were available within the requested scope.

#### E\_SYSTEM\_PERM

A serious and permanent software or system error has been detected which prevents completion of the operation.

#### E\_SYSTEM\_TEMP

A serious but temporary software or system error has been detected which prevents completion of the operation.

#### E\_TIMEOUT

The operation has not completed within the allotted time.

#### E\_UNABLE\_TO\_COMPLETE

The DSA is unable to complete this operation, or others like it. (This applies particularly to search.)

#### E\_UNABLE\_TO\_PROCEED

The DSA cannot satisfy the operation after receiving it on the basis of a valid non-specific subordinate reference.

#### E\_UNDEFINED\_ATT

A locally unsupported attribute has been encountered.

#### E\_UNSUPPORTED\_OC

The object class of the entry is not supported as a valid object class for entries within this DSA.

#### E\_VERSION

An unexpected version has been found in Bind.

#### E\_ZERO\_VALUES

An attribute is found at the conclusion of a modify operation (add-entry or modify-entry) to possess no value at all. Such an error would occur, for example, when a single value is removed by a modify-entry operation.

This error would not occur when a single value is removed for an attribute, followed by addition of a value for the same attribute, all within the same modify operation. This transient situation should be tolerated by implementations, since the attribute conforms to requirements at the end of the operation. (See also under E\_NOT\_SINGLE\_VALUED.)

NOTE: The result of a read operation may contain attributes without values as a consequence of access controls on the values that might otherwise have been returned. This situation is not related to the E\_ZERO\_VALUES error condition.

### 3 Situations

The following situations are recognised within which particular symptoms may give rise to distinct error actions:

#### BIND-LOCAL

A bind is being attempted; either the entry named is (or should be) within a local naming context, or name resolution is being carried out on the part of the name that is known locally.

#### BIND-REMOTE

A bind is being attempted, and the entry named is not within a local naming context; remote validation of credentials is being carried out.

#### NAME-RESOLUTION

Name resolution is being carried out.

#### ADD-ENTRY-NAME-RESOLUTION

During an add entry operation, name resolution has been successfully accomplished on the superior object, and is now being carried out to determine whether the new entry already exists. (If it does, there is an error.)

#### ADD-ENTRY

The entry is being generated.

#### MODIFY-ENTRY

The entry is being modified.

#### MODIFY-RDN

The RDN is being modified.

#### REMOVE-ENTRY

The entry is being removed.

#### READ

The entry is being read.

#### COMPARE

A Compare operation is being carried out on the entry.

#### LIST

A List operation is being carried out on the entry.

#### SEARCH-FILTER

A Search operation is being carried out; the filter is being evaluated or acted upon.

#### SEARCH-ENTRY

A Search operation is being carried out; the required entry information is being evaluated or acted upon.

ABANDON

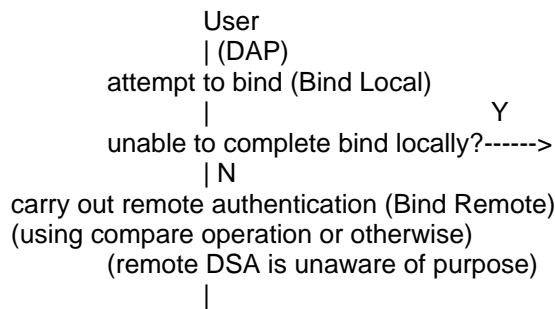
An Abandon operation is being carried out.

TRACE-EVALUATION

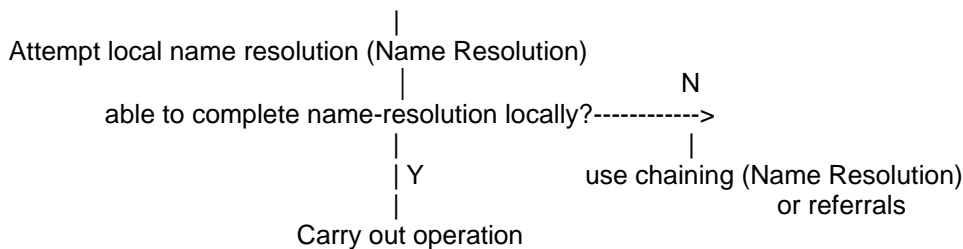
The trace element is being evaluated for loops.

The situations imply some models of behaviour:

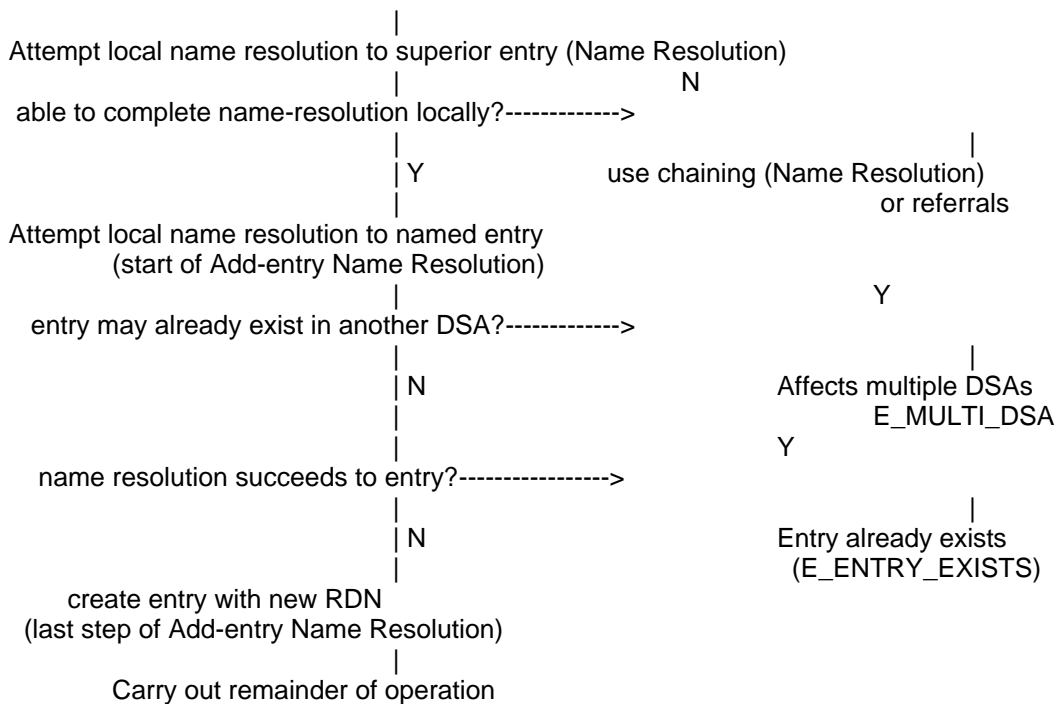
**A. Bind**



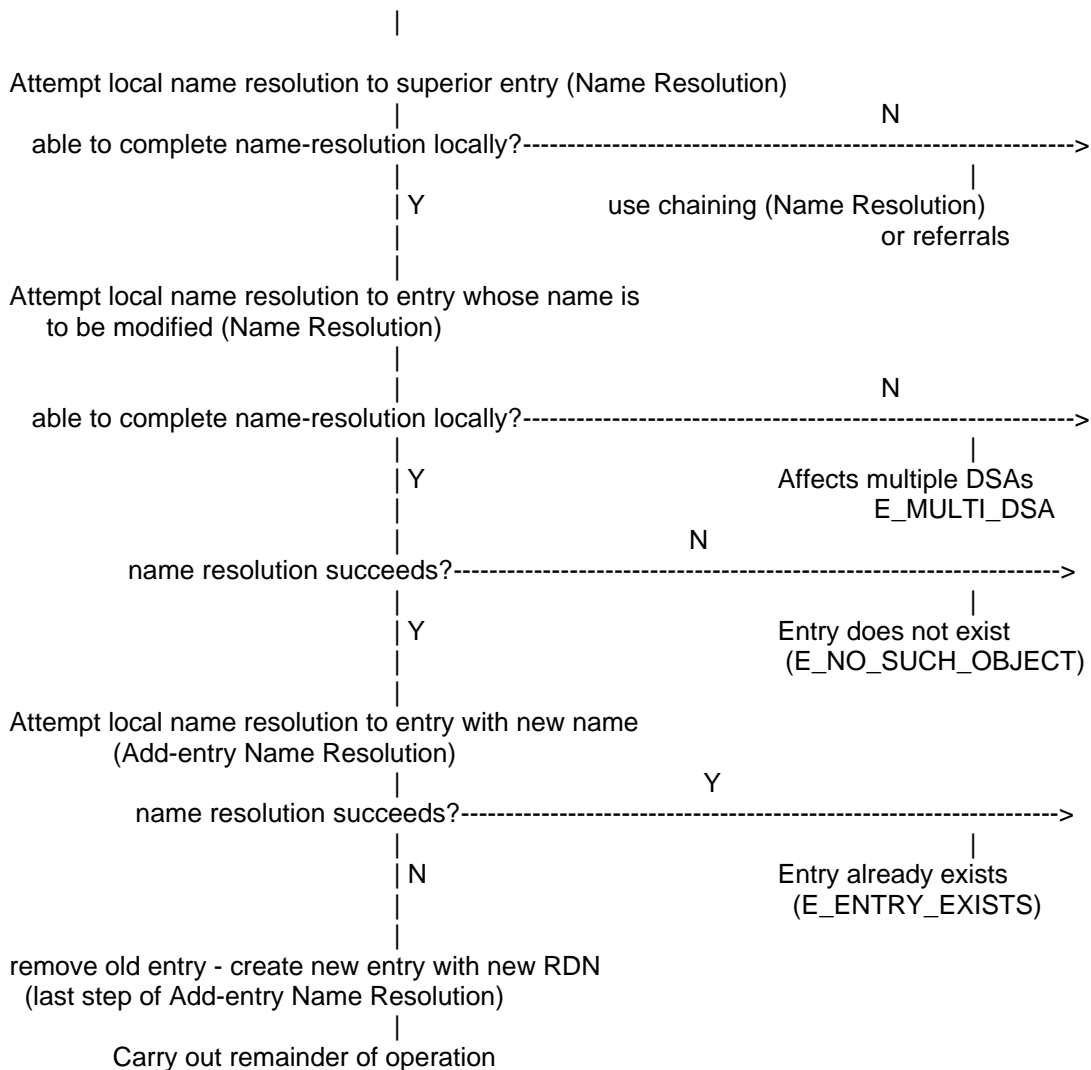
**B. Normal operation evaluation (not add-entry or modify-RDN)**



**C. Add-entry operation evaluation**



D. Modify-RDN operation evaluation



## 4 Error actions

In the following tables, the recommended actions are identified for all the error symptoms in each situation in which it may be encountered.

The notation is as follows:

Rej - A Reject operation is generated, with problem mistyped-argument.

Ab(ppp) - Abandon Failed Error is generated. ppp may take values codified as follows:

- CA - Cannot abandon;
- NSO - No such operation;
- TL - Too late.

A(ppp) - Attribute Error is generated. ppp may take values:

- AVE - Attribute or value already exists;
- CV - Constraint violation;
- IAS - Invalid attribute syntax;
- IM - Inappropriate matching;
- NSA - No such attribute or value;
- UAT - Undefined attribute type.

N(ppp) - Name Error is generated. ppp may take values:

- ADP - Alias de referencing problem;
- AP - Alias problem;
- IAS - Invalid Attribute Syntax;
- NSO - No such object.

SC(ppp) - Security Error is generated. ppp may take values:

- IA - Inappropriate authentication;
- IAR - Insufficient access rights;
- IC - Invalid credentials;
- IS - Invalid signature;
- NI - No information;
- PR - Protection required.

NOTE 1: SC(NI) may be used in place of any other Security Error.

S(ppp) - Service Error is generated. ppp may take values:

- ALE - Administrative limit exceeded;
- B - Busy;
- CR - Chaining required;
- DE - DIT Error;
- IR - Invalid reference;
- LD - Loop detected;
- OOS - Out of scope;
- TLE - Time limit exceeded;
- UA - Unavailable;
- UAP - Unable to proceed;
- UCE - Unavailable critical extension;
- UWP - Unwilling to perform.

U(ppp) - Update Error is generated. ppp may take values:

- AMD - Affects multiple DSAs;
- EAE - Entry already exists;
- NAN - Not allowed on non-leaf;
- NAR - Not allowed on RDN;
- NV - Naming violation;
- OCV - Object class violation;
- OMP - Object class modification prohibited.

NOTE 2: U(NAR) is used when an attempt is made to remove a naming attribute.

In addition, bracketed numerals give NOTES.



Table 1

	Bind Local	Bind Remote	Name Resolution	Add-Entry Name-Resol'n
E_ACCESS	-	-	SC(IAR)(17)IA	SC(IAR)(17)
E_ADMIN_LIMIT	-	S(UA)	S(ALE)	-
E_ALIAS_DEREF (8)	SC(IC)	SC(IC)	N(ADP)	-
E_ALIAS_LOOP	-	-	-	-
E_ALIAS_PROBLEM (8)	SC(IC)	SC(IC)	N(AP)	-
E_ARG_BOUNDS	(9)	(7)	S(UWP)(11)U	S(WP)(11)
E_ARG_SYNTAX	(1)	(1)	Rej	Rej
E_ARG_VIOL	(1)	(1)	Rej	Rej
E_ATT_BOUNDS	SC(IC)	(7)	N(NSO)(16)	(7)
E_ATT_OR_VALUE_EXISTS	-	-	-	-
E_ATT_VALUE	SC(IC)	(28)	N(NSO)(16)	N(IAS)(29)
E_AUTHENTICATION	SC(IA)	SC(IA)	-	-
E_BUSY	S(UA)	S(UA)	S(B)	S(B)
E_CHAIN	-	-	S(CR)	-
E_CREDENTIALS	SC(IC)	SC(IC)	-	-
E_DBE	S(UA)	-	S(UA)	S(UA)
E_DN	SC(IC)	SC(IC)	N(NSO)	U(NV)
E_DSA	-	S(UA)	S(UA)(19)	S(UA)(20)
E_ENTRY_EXISTS	-	-	-	U(EAE)
E_EXTENSION	-	-	S(UCE)(21)	S(UCE)(21)
E_ILLEGAL_ROOT_OBJECT	SC(IC)(23)	SC(IC)	N(NSO)(23)	(24)
E_ILLEGAL_ROOT_VALUE	SC(IC)	SC(IC)(7)	N(IAS)(26)	N(IAS)(26)
E_LOOP	-	S(UA)	S(LD)	-
E_MATCH	SC(IC)	SC(IC)	A(IM)	A(IM)
E_MISSING_OBJECT_CLASS	-	-	-	-
E_MULTI_DSA	-	-	U(AMD)(31)	U(AMD)
E_NAMING_VIOLATION	-	-	-	U(NV)
E_NO_SUCH_ATT	-	-	-	-
E_NO_SUCH_OBJECT	SC(IC)	SC(IC)	N(NSO)	-
E_NON_LEAF_OPERATION	-	-	-	-
E_NO_SUCH_VALUE	-	-	-	-
E_NONNAMING_ATTRIBUTE	-	-	-	U(NV)
E_NOT_SINGLE_VALUED	-	-	-	-
E_OBJECT_CLASS_MOD	-	-	-	-
E_OBJECT_CLASS_VIOL	-	-	-	-
E_REFERENCE	-	S(UA)	S(IR)(33)	-
E_REM_NAMING_ATT	-	-	-	-
E_SCOPE	-	-	(22)	-
E_SYSTEM_PERM	S(UA)	-	S(UWP)	S(UWP)
E_SYSTEM_TEMP	S(UA)	-	S(UA)	S(UA)
E_TIMEOUT	S(UA)	(10)	S(TLE)	S(TLE)
E_UNABLE_TO_COMPLETE	-	S(UA)	-	-
E_UNABLE_TO_PROCEED	-	(2)	(2)	-
E_UNDEFINED_ATT	SC(IC)	-	(3)	U(NV)
E_UNSUPPORTED_OC	-	-	-	-
E_VERSION	S(UA)	-	-	-
E_ZERO_VALUES	-	-	-	-

Table 2

	Add-Entry	Modify Entry	Trace Evaluation
E_ACCESS	SC(IAR)(17)	SC(IAR)(17)-	
E_ADMIN_LIMIT	S(ALE)	S(ALE)	-
E_ALIAS_DEREF	-	-	-
E_ALIAS_LOOP	-	-	-
E_ALIAS_PROBLEM	-	-	-
E_ARG_BOUNDS	S(UWP)(11)	S(UWP)(11)	-
E_ARG_SYNTAX	Rej	Rej	Rej
E_ARG_VIOL	Rej	Rej	Rej
E_ATT_BOUNDS	A(CV)	A(CV)	(7)
E_ATT_OR_VALUE_EXISTS	A(AVE)	A(AVE)	-
E_ATT_VALUE	A(IAS)	A(IAS)	(7)
E_AUTHENTICATION	-	-	-
E_BUSY	S(B)	S(B)	-
E_CHAIN	-	-	-
E_CREDENTIALS	-	-	-
E_DBE	S(UA)	S(UA)	-
E_DN	-	-	-
E_DSA	-	-	-
E_ENTRY_EXISTS	-	-	-
E_EXTENSION	S(UCE)	S(UCE)	-
E_ILLEGAL_ROOT_OBJECT	N(NSO)	N(NSO)	-
E_ILLEGAL_ROOT_VALUE	A(IAS)	A(IAS)	(7)
E_LOOP	-	-	-
E_MATCH	-	A(IM)	(7)
E_MISSING_OBJECT_CLASS	U(OCV)	U(OMP)	-
E_MULTI_DSA	-	-	-
E_NAMING_VIOLATION	-	-	-
E_NO_SUCH_ATT	-	A(NSA)	-
E_NO_SUCH_OBJECT	-	-	-
E_NO_SUCH_VALUE	-	A(NSA)	-
E_NON_LEAF_OPERATION	-	-	-
E_NONNAMING_ATTRIBUTE	-	-	-
E_NOT_SINGLE_VALUED	A(CV)	A(CV)	-
E_OBJECT_CLASS_MOD	-	U(OMP)	-
E_OBJECT_CLASS_VIOL	U(OCV)	U(OCV)	-
E_REFERENCE	-	-	-
E_REM_NAMING_ATT	-	U(NAR)	-
E_SCOPE	-	-	-
E_SYSTEM_PERM	S(UWP)	S(UWP)	S(UWP)
E_SYSTEM_TEMP	S(UA)	S(UA)	S(UA)
E_TIMEOUT	S(TLE)	S(TLE)	-
E_UNABLE_TO_COMPLETE	-	-	-
E_UNABLE_TO_PROCEED	-	-	-
E_UNDEFINED_ATT	A(UAT)	A(UAT)	(7)
E_UNSUPPORTED_OC	U(OCV)	-	-
E_VERSION	-	-	-
E_ZERO_VALUES	A(CV)	A(CV)	-

Table 3

	Modify RDN	Remove Entry	Read	Compare
E_ACCESS	SC(IAR)	SC(IAR)	(15)	SC(IAR)
E_ADMIN_LIMIT	-	-	S(ALE)	-
E_ALIAS_DEREF	-	-	-	-
E_ALIAS_LOOP	-	-	-	-
E_ALIAS_PROBLEM	-	-	-	-
E_ARG_BOUNDS	S(UWP)(11)	-	S(UWP)(11)	S(UWP)(11)
E_ARG_SYNTAX	Rej	Rej	Rej	Rej
E_ARG_VIOL	Rej	Rej	Rej	Rej
E_ATT_BOUNDS	A(CV)	-	-	(32)
E_ATT_OR_VALUE_EXISTS	-	-	-	-
E_ATT_VALUE	A(IAS)	-	-	A(IAS)
E_AUTHENTICATION	-	-	-	-
E_BUSY	S(B)	S(B)	S(B)	S(B)
E_CHAIN	-	-	-	-
E_CREDENTIALS	-	-	-	-
E_DBE	S(UA)	S(UA)	S(UA)	S(UA)
E_DN	U(NV)	-	-	-
E_DSA	-	-	-	-
E_ENTRY_EXISTS	U(EAE)	-	-	-
E_EXTENSION	S(UCE)	S(UCE)	S(UCE)	S(UCE)
E_ILLEGAL_ROOT_OBJECT	(24)	N(NSO)	N(NSO)	N(NSO)
E_ILLEGAL_ROOT_VALUE	N(IAS)(26)	-	-	(7)
E_LOOP	-	-	-	-
E_MATCH	A(IM)	-	-	A(IM)
E_MISSING_OBJECT_CLASS	-	-	-	-
E_MULTI_DSA	U(AMD)	U(AMD)	-	-
E_NAMING_VIOLATION	U(NV)	-	-	-
E_NO_SUCH_ATT	-	-	A(NSA)(4)	A(NSA)
E_NO_SUCH_OBJECT	-	-	-	-
E_NO_SUCH_VALUE	-	-	-	-
E_NON_LEAF_OPERATION	U(NAN)	U(NAN)	-	-
E_NONNAMING_ATTRIBUTE	(34)	-	-	-
E_NOT_SINGLE_VALUED	A(CV)	-	-	-
E_OBJECT_CLASS_MOD	-	-	-	-
E_OBJECT_CLASS_VIOL	U(OCV)	-	-	-
E_REFERENCE	-	-	-	-
E_REM_NAMING_ATT	-	-	-	-
E_SCOPE	-	-	-	-
E_SYSTEM_PERM	S(UWP)	S(UWP)	S(UWP)	S(UWP)
E_SYSTEM_TEMP	S(UA)	S(UA)	S(UA)	S(UA)
E_TIMEOUT	S(TLE)	S(TLE)	S(TLE)	S(TLE)
E_UNABLE_TO_COMPLETE	-	-	-	-
E_UNABLE_TO_PROCEED	-	-	-	-
E_UNDEFINED_ATT	A(UAT)	-	A(NSA)(4)	A(NSA)
E_UNSUPPORTED_OC	-	-	-	-
E_VERSION	-	-	-	-
E_ZERO_VALUES	(12)	-	-	-

Table 4

	List	Search (Filter)	Search (Entry)	Abandon
E_ACCESS	SC(IAR)	SC(IAR)	(15)	-
E_ADMIN_LIMIT	S(ALE)	S(ALE)	-	-
E_ALIAS_DEREF	-	(5)	-	-
E_ALIAS_LOOP	-	(5)	-	-
E_ALIAS_PROBLEM	-	(5)	-	-
E_ARG_BOUNDS	S(UWP)(11)	S(UWP)(11)	S(UWP)(11)	-
E_ARG_SYNTAX	Rej	Rej	Rej	Rej
E_ARG_VIOL	Rej	Rej	Rej	-
E_ATT_BOUNDS	-	(7)	-	-
E_ATT_OR_VALUE_EXISTS	-	-	-	-
E_ATT_VALUE	-	A(IAS)	-	-
E_AUTHENTICATION	-	-	-	-
E_BUSY	S(B)	S(B)	S(B)	-
E_CHAIN	-	-	-	-
E_CREDENTIALS	-	-	-	-
E_DBE	S(UA)	S(UA)	S(UA)	-
E_DN	-	-	-	-
E_DSA	(5)	(5)	-	-
E_ENTRY_EXISTS	-	-	-	-
E_EXTENSION	S(UCE)	S(UCE)	S(UCE)	-
E_ILLEGAL_ROOT_OBJECT	-	(13)	-	-
E_ILLEGAL_ROOT_VALUE	-	(7)	-	-
E_LOOP	(5)	(5)	-	-
E_MATCH	-	(27)	-	-
E_MISSING_OBJECT_CLASS	-	-	-	-
E_MULTI_DSA	-	-	-	-
E_NAMING_VIOLATION	-	-	-	-
E_NO_SUCH_ATT	-	-	-	-
E_NO_SUCH_OBJECT	-	-	-	-
E_NO_SUCH_VALUE	-	-	-	-
E_NON_LEAF_OPERATION	-	-	-	-
E_NON_NAMING_ATTRIBUTE	-	-	-	-
E_NOT_SINGLE_VALUED	-	-	-	-
E_OBJECT_CLASS_MOD	-	-	-	-
E_OBJECT_CLASS_VIOL	-	-	-	-
E_REFERENCE	-	-	-	-
E_REM_NAMING_ATT	-	-	-	-
E_SCOPE	-	-	-	-
E_SYSTEM_PERM	S(UWP)	S(UWP)	S(UWP)	Ab(CA)
E_SYSTEM_TEMP	S(UA)	S(UA)	S(UA)	Ab(CA)
E_TIMEOUT	S(TLE)(30)	S(TLE)(30)	S(TLE)(30)	-
E_UNABLE_TO_COMPLETE	S(B)(30)	S(B)(30)	S(B)(30)	Ab(CA)
E_UNABLE_TO_PROCEED	-	-	-	-
E_UNDEFINED_ATT	-	(6)	(6)	-
E_UNSUPPORTED_OC	-	-	-	-
E_VERSION	-	-	-	-
E_ZERO_VALUES	-	-	-	-

- NOTES to tables 1 to 4
- 1 Use A-U-ABORT. Note, however, that extra elements are permitted here.
  - 2 An "unable-to-proceed" error becomes SC(IC) for bind and N(NSO) for operations if no DSA contacted can locate the object.
  - 3 An undefined attribute encountered during name resolution is only an error - N(NSO) - if the entry is identified as local.
  - 4 The A(NSA) condition is reserved for "read" when no attribute of the specific list provided can be returned (for reasons that include security errors).
  - 5 Any failure to propagate a list or search causes abandonment of that part of the search. The DSA should nevertheless provide a continuation reference corresponding to the point where the search is abandoned. This may but need not quote the access point of the DSA or DSAs which could not be contacted (in accordance with A/DI3).
  - 6 Undefined attributes are regarded as not matched or found, but cause no errors in search.
  - 7 This error, if detected, should be ignored; processing continues.
  - 8 The use of aliases in bind arguments may be prohibited.
  - 9 This error would occur as a result of a bind argument with a name containing too many RDNs for the DSA. Use either S(UA) or SC(IC).
  - 10 This situation occurs when a DSA has to send a compare (or read) operation to another DSA in order to complete the process of authentication, and this secondary operation times out. DSAs should use the time-limit service control with local time-out to limit the remote validation of credentials; if the operation fails as a result, S(UA) is used.
  - 11 The use of Reject is also permitted here.
  - 12 Either the whole attribute should be removed, or the delete Old RDN flag should be ignored.
  - 13 For a single-entry search, N(NSO) may be used.
  - 14 If there is no permission to detect the entry, N(NSO) should be used. See also 17 below.
  - 15 Attributes for which there are insufficient access rights for them to be returned should be ignored, unless the result is to return no attributes at all. In the case of search, the result should then be to return no attributes. In the case of read, the result should either be SC(IAR) or A(NSA). See also 17 below.
  - 16 It is not necessary to check for this error during Name Resolution; if a check is made, it is legitimate to use the name error Invalid Attribute-syntax. If no check is made, the DSA will normally find that local name resolution fails. It may then either determine that no such object exists, in which case it should then use the name error no-such-object. Otherwise, it determines that another DSA should handle the operation; it may then pass the operation to the other DSA, without generating an error.
  - 17 In every case where a security error occurs, except in bind, SC(NI) may be used in place of the specified problem, to support a Security Policy which states that no information on the problem may be divulged. In the case of bind, SC(NI) is not available.
  - 18 If this situation occurs, it is reported in the Partial Outcome Qualifier.

- 19 A referral is an acceptable alternative outcome.
- 20 This situation can only occur when two DSAs are involved (i.e. in a situation not covered by the 1988 standards). There are two cases:
- a) there is a non-specific subordinate reference at the superior entry, but one (or more) of the DSAs referenced cannot be contacted to find out if there is a name clash with the new entry;
- OR
- b) a new naming context is being set up in a second DSA, but it cannot be contacted, to do so, by the first DSA.
- 21 These cases apply only when name resolution is directly affected by the extension. No such instances are even planned for the 1992 version of the Directory standards.
- 22 This error applies only in DAP Referral mode.
- 23 For some operations, using a root is incorrect (except possibly for locally-defined management purposes); the correct error is N(NSO).
- 24 When root is the superior entry, creation of a new entry using add-entry or modify-RDN may be prohibited by local rules (e.g. it always involves creating a new naming context, which will typically require further information to be supplied in an implementation-dependent manner). In this case, S(UWP) is probably best.
- An attempt by an add-entry to create a root object (e.g. no RDNs in the new entry's object name is incorrect. N(NSO) is probably correct here, but S(UWP) would also be acceptable.
- 25 Or follow NOTE 7 above.
- 26 S(UWP) would also be acceptable.
- 27 Such a match should be evaluated as Undefined, without error.
- 28 A DSA may determine that the bind should fail (using SC(IC)) or may pass the credentials to another DSA, without generating an error.
- 29 If an E\_MULTI\_DSA error is also occasioned, this takes precedence.
- 30 Partial results may also be returned. "Unexplored" in Partial Outcome Qualifier can also point to parts of the DIT not explored.
- 31 E\_MULTI\_DSA occurs in name resolution when a modify-RDN operation specifies an entry for which the superior entry is in a different DSA to the object itself.
- 32 Use a no-match response to the compare operation - but A(CV) is acceptable.
- 33 In the case where a subordinate reference is invalid, the DSA receiving S(IR) passes back S(DE) in place of S(IR).
- 34 Treat as for Add-entry Name Resolution.

## 5 Reporting

In addition to the use of error-reporting services, DSAs are recommended to implement logging services to assist in management of the Directory. The following (not necessarily complete) classes of error should be logged:

- errors indicating attempted breaches of security (not, however, normally including attempted access to entries within the scope of a search to which access rights are denied);
- errors indicating local software or hardware malfunction, possibly giving rise to data corruption;
- errors indicating malfunction or other unacceptable behaviour on the part of the invoker of the operation;
- errors indicating unexpected loss of chaining service to or from another DSA;
- error conditions that would be difficult to diagnose with the level of detail supplied over the protocol;
- aborts and other exceptional communications events.

The form and accessibility of any such logs is for further study.

## History

Document history	
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