[MS-DFSNM]:

Distributed File System (DFS): Namespace Management Protocol

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1 Introduction

The Distributed File System (DFS): Namespace Management Protocol provides a **remote procedure call (RPC)** interface for administering **DFS** configurations. The client is an application that issues method calls on the RPC interface to administer DFS. The server is a DFS service that implements support for this RPC interface for administering DFS.

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in [RFC2119]. Sections 1.5 and 1.9 are also normative but do not contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are specific to this document:

8.3 name: A file name string restricted in length to 12 characters that includes a base name of up to eight characters, one character for a period, and up to three characters for a file name extension. For more information on 8.3 file names, see [MS-CIFS] section 2.2.1.1.1.

Access Based Directory Enumeration (ABDE) mode: A mode where the server filters directory entries according to the access permissions of the client. In a **DFS** scenario, ABDE is enabled on the **DFS root target share** to prevent a user from seeing another user's home directory. The **DFS namespace** administrator can create a **DFS link** for a user (or user group), and a user is granted appropriate rights to the **DFS link**.

access control list (ACL): A list of access control entries (ACEs) that collectively describe the security rules for authorizing access to some resource; for example, an object or set of objects.

Active Directory: A general-purpose network **directory service**. **Active Directory** also refers to the Windows implementation of a **directory service**. **Active Directory** stores information about a variety of **objects** in the network. Importantly, user accounts, computer accounts, groups, and all related credential information used by the Windows implementation of Kerberos are stored in **Active Directory**. **Active Directory** is either deployed as **Active Directory Domain Services (AD DS)** or Active Directory Lightweight Directory Services (AD LDS). [MS-ADTS] describes both forms. For more information, see [MS-AUTHSOD] section 1.1.1.5.2, **Lightweight Directory Access Protocol (LDAP)** versions 2 and 3, Kerberos, and DNS.

Active Directory Domain Services (AD DS): A **directory service (DS)** implemented by a **domain controller (DC)**. The **DS** provides a data store for **objects** that is distributed across multiple **DCs**. The **DCs** interoperate as peers to ensure that a local change to an **object** replicates correctly across **DCs**. For more information, see [MS-AUTHSOD] section 1.1.1.5.2 and [MS-ADTS]. For information about product versions, see [MS-ADTS] section 1. See also **Active Directory**.

authentication level: A numeric value indicating the level of authentication or message protection that **remote procedure call (RPC)** will apply to a specific message exchange. For more information, see [C706] section 13.1.2.1 and [MS-RPCE].

binary large object (BLOB): A discrete packet of data that is stored in a database and is treated as a sequence of uninterpreted bytes.

clustered DFS namespace: A **stand-alone DFS namespace** that is hosted on a file server cluster.

Coordinated Universal Time (UTC): A high-precision atomic time standard that approximately tracks Universal Time (UT). It is the basis for legal, civil time all over the Earth. Time zones around the world are expressed as positive and negative offsets from UTC. In this role, it is also

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referred to as Zulu time (Z) and Greenwich Mean Time (GMT). In these specifications, all references to UTC refer to the time at UTC-0 (or GMT).

DFS namespace name: The second path component of a **DFS path**. In the **DFS path** \\MyDomain\MyDfs\MyDir, the DFS namespace name is MyDfs.

DFS server: A server computer that runs the **DFS** service required to respond to **DFS referral** requests. Also interchangeably used to refer to the **DFS** service itself.

DFS target: Either a **DFS root target** server or a **DFS link target** server.

directory service (DS): A service that stores and organizes information about a computer network's users and network shares, and that allows network administrators to manage users' access to the shares. See also **Active Directory**.

distinguished name (DN): A name that uniquely identifies an object by using the **relative distinguished name (RDN)** for the object, and the names of container objects and domains that contain the object. The distinguished name (DN) identifies the object and its location in a tree.

Distributed File System (DFS): A file system that logically groups physical shared folders located on different servers by transparently connecting them to one or more hierarchical namespaces. **DFS** also provides fault-tolerance and load-sharing capabilities. **DFS** refers to the Microsoft DFS available in Windows Server operating system platforms.

Distributed File System (DFS) client: A computer that is used to access a **DFS** namespace. It also can refer to the **DFS** software on a client that accesses the **DFS** namespace.

Distributed File System (DFS) client target failback: An optional feature that, when enabled, permits a **DFS** client to revert to a more optimal DFS target at an appropriate time after a DFS client target failover. The term "failback" refers to **DFS client target failback**. The DFS Referral Protocol, as specified in [MS-DFSC], describes the mechanisms by which a DFS server provides a list of DFS targets in decreasing order of optimality to the client.

Distributed File System (DFS) in-site referral mode: A mode in which **DFS root** or **DFS link** referral requests to a DFS server result in **DFS referral** responses with only those DFS targets in the same **Active Directory Domain Services (AD DS)** site as the **DFS client** requesting the **DFS referral**. When this mode is disabled, there is no restriction on the **AD DS** site of the targets returned in the referral response. This can be enabled per **DFS namespace**. If there are no DFS targets in the same **AD DS** site as the client, the **DFS referral** response may be empty.

Distributed File System (DFS) interlink: A special form of **DFS link** whose link target is a DFS domain-based namespace.

Distributed File System (DFS) link: A component in a **DFS path** that lies below the **DFS root** and maps to one or more **DFS link targets**. Also interchangeably used to refer to a **DFS path** that contains the **DFS link**.

Distributed File System (DFS) link target: The mapping destination of a link. A link target can be any **Universal Naming Convention (UNC)** path. For example, a link target could be a share or another **Distributed File System (DFS)** path.

Distributed File System (DFS) metadata: Information about a **Distributed File System (DFS)** namespace such as namespace name, **DFS** links, **DFS** link targets, and so on, that is maintained by a **DFS** server. For domain-based **DFS**, the metadata is stored in an **Active Directory Domain Services (AD DS)** object corresponding to the **DFS** namespace. For a stand-alone **DFS namespace**, the **DFS root target** stores the **DFS metadata** in an implementation-defined manner; for example, in the registry.

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Distributed File System (DFS) namespace: A virtual view of shares on different servers as provided by **DFS**. Each file in the namespace has a logical name and a corresponding address (path). A **DFS namespace** consists of a root and many links and targets. The namespace starts with a root that maps to one or more root targets. Below the root are links that map to their own targets.

Distributed File System (DFS) namespace, domain-based: A **DFS namespace** that has configuration information stored in the **Active Directory** directory service. The **DFS namespace** may span over a distributed system that is organized hierarchically into logical domains, each with a **domain controller (DC)**. The path to access the root or a link starts with the host domain name. A domain-based **DFS root** can have multiple root targets, which offers fault tolerance and load sharing at the root level.

Distributed File System (DFS) namespace, standalone: A **DFS namespace** that has metadata stored locally on the host server. The path to access the root or a link starts with the host server name. A stand-alone **DFS root** has only one root target. Stand-alone roots are not fault-tolerant; when the root target is unavailable, the entire **DFS namespace** is inaccessible. Stand-alone **DFS roots** can be made fault tolerant by creating them on clustered file servers.

Distributed File System (DFS) path: Any **Universal Naming Convention (UNC)** path that starts with a **DFS root** and is used for accessing a file or directory in a **DFS namespace**.

Distributed File System (DFS) referral: A **DFS client** issues a **DFS referral** request to a **DFS root target** or a **DC**, depending on the **DFS path** accessed, to resolve a **DFS root** to a set of **DFS root targets**, or a **DFS link** to a set of **DFS link targets**. The **DFS client** uses the referral request process as needed to finally identify the actual **share** on a server that has accessed the leaf component of the **DFS path**. The request for a **DFS referral** is referred to as DFS referral request, and the response for such a request is referred to as DFS referral response.

Distributed File System (DFS) referral site costing: When appropriately enabled for a **DFS namespace**, an optional feature that results in a **DFS referral** response. In the referral response, targets are grouped into sets based on increasing **Active Directory Domain Services (AD DS)** site cost from the **DFS client** that is requesting the referral to the **DFS** target server. When this feature is disabled, the referral response consists of at most two target sets: one set consisting of all **DFS** targets in the same **AD DS** site as the **DFS client**, and the other set consisting of **DFS** targets that are not in the same **AD DS** site as the **DFS client**.

Distributed File System (DFS) root: The starting point of the **DFS namespace**. The root is often used to refer to the namespace as a whole. A **DFS root** maps to one or more root targets, each of which corresponds to a share on a separate server. A **DFS root** has one of the following formats “\\<ServerName>\<RootName>” or “\\<DomainName>\<RootName>”. Where <ServerName> is the name of the root target server hosting the **DFS namespace**; <DomainName> is the name of the domain that hosts the **DFS root**; and <RootName> is the name of the root of a domain-based **DFS**. The **DFS root** must reside on an NTFS volume.

Distributed File System (DFS) root scalability mode: Domain-based **DFS root** targets normally poll the **primary domain controller (PDC)** to check for any change in the **DFS metadata** of a **DFS namespace**. When the **DFS** server on a **DFS root** target supports this mode, and it is enabled for a **DFS namespace**, the **DFS** server instead polls a **domain controller (DC)** closer to it in terms of **Active Directory Domain Services (AD DS)** site cost.

Distributed File System (DFS) root target: A server that hosts a **DFS root** of a **DFS namespace**. A domain-based DFS namespace can have multiple **DFS root targets**; a standalone DFS namespace can have only one **DFS root target**.

Distributed File System (DFS) server: A server computer running the **DFS** service that responds to **DFS referral** requests, as specified in [MS-DFSC], as well as to the DFS: Namespace Management Protocol. Also used interchangeably to refer to the **DFS** service itself.

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domain: A set of users and computers sharing a common namespace and management infrastructure. At least one computer member of the set must act as a **domain controller (DC)** and host a member list that identifies all members of the domain, as well as optionally hosting the **Active Directory** service. The domain controller provides authentication (2) of members, creating a unit of trust for its members. Each domain has an identifier that is shared among its members. For more information, see [MS-AUTHSOD] section 1.1.1.5 and [MS-ADTS].

domain controller (DC): The service, running on a server, that implements **Active Directory**, or the server hosting this service. The service hosts the data store for **objects** and interoperates with other **DCs** to ensure that a local change to an **object** replicates correctly across all **DCs**. When **Active Directory** is operating as **Active Directory Domain Services (AD DS)**, the **DC** contains full NC replicas of the configuration naming context (config NC), schema naming context (schema NC), and one of the domain NCs in its **forest**. If the **AD DS DC** is a global catalog server (GC server), it contains partial NC replicas of the remaining domain NCs in its **forest**. For more information, see [MS-AUTHSOD] section 1.1.1.5.2 and [MS-ADTS]. When **Active Directory** is operating as Active Directory Lightweight Directory Services (AD LDS), several AD LDS **DCs** can run on one server. When **Active Directory** is operating as **AD DS**, only one **AD DS DC** can run on one server. However, several AD LDS **DCs** can coexist with one **AD DS DC** on one server. The AD LDS **DC** contains full NC replicas of the config NC and the schema NC in its **forest**.

domain-based DFS namespace: A **DFS namespace** that has configuration information stored in domain services. The **DFS namespace** may span a distributed system that is organized hierarchically into logical domains. The path to access a **domain-based DFS namespace** starts with the host domain name. A **domain-based DFS namespace** can have multiple **DFS root targets**, which offers high availability and load sharing at the **DFS root** level.

domainv1-based DFS namespace: A type of **domain-based DFS namespace** that has its **DFS metadata** stored in directory services as an ftDfs type **object**.

domainv2-based DFS namespace: A type of **domain-based DFS namespace** that has its **DFS metadata** stored in the form of individual **LDAP** entries, with one **LDAP** entry per **DFS link**. Each **LDAP** entry contains the **DFS metadata** (such as targets, properties, and other information) that corresponds to that entity.

dynamic object: An object with a time-to-die (attribute msDS-Entry-Time-To-Die). The directory service garbage-collects a **dynamic object** immediately after its time-to-die has passed. The constructed attribute entryTTL gives a **dynamic object's** current time-to-live, that is, the difference between the current time and msDS-Entry-Time-To-Die. For more information, see [RFC2589].

endpoint: A network-specific address of a remote procedure call (RPC) server process for remote procedure calls. The actual name and type of the endpoint depends on the **RPC** protocol sequence that is being used. For example, for RPC over TCP (RPC Protocol Sequence ncacn_ip_tcp), an endpoint might be TCP port 1025. For RPC over Server Message Block (RPC Protocol Sequence ncacn_np), an endpoint might be the name of a named pipe. For more information, see [C706].

file system: A system that enables applications to store and retrieve files on storage devices. Files are placed in a hierarchical structure. The file system specifies naming conventions for files and the format for specifying the path to a file in the tree structure. Each file system consists of one or more drivers and DLLs that define the data formats and features of the file system. File systems can exist on the following storage devices: diskettes, hard disks, jukeboxes, removable optical disks, and tape backup units.

forest: One or more **domains** that share a common schema and trust each other transitively. An organization can have multiple **forests**. A **forest** establishes the security and administrative boundary for all the **objects** that reside within the **domains** that belong to the **forest**. In contrast, a **domain** establishes the administrative boundary for managing **objects**, such as

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users, groups, and computers. In addition, each **domain** has individual security policies and trust relationships with other **domains**.

globally unique identifier (GUID): A term used interchangeably with **universally unique identifier (UUID)** in Microsoft protocol technical documents (TDs). Interchanging the usage of these terms does not imply or require a specific algorithm or mechanism to generate the value. Specifically, the use of this term does not imply or require that the algorithms described in [RFC4122] or [C706] must be used for generating the **GUID**. See also **universally unique identifier (UUID)**.

host name: The name of a host on a network that is used for identification and access purposes by humans and other computers on the network.

Interface Definition Language (IDL): The International Standards Organization (ISO) standard language for specifying the interface for remote procedure calls. For more information, see [C706] section 4.

Lightweight Directory Access Protocol (LDAP): The primary access protocol for **Active Directory**. Lightweight Directory Access Protocol (LDAP) is an industry-standard protocol, established by the Internet Engineering Task Force (IETF), which allows users to query and update information in a **directory service (DS)**, as described in [MS-ADTS]. The Lightweight Directory Access Protocol can be either version 2 [RFC1777] or version 3 [RFC3377].

little-endian: Multiple-byte values that are byte-ordered with the least significant byte stored in the memory location with the lowest address.

member server: A server that is joined to a domain and is not acting as an **Active Directory domain controller (DC)**. Member servers typically function as file servers, application servers, and so on and defer user authentication to the domain controller.

Microsoft Interface Definition Language (MIDL): The Microsoft implementation and extension of the OSF-DCE **Interface Definition Language (IDL)**. **MIDL** can also mean the **Interface Definition Language (IDL)** compiler provided by Microsoft. For more information, see [MS-RPCE].

NetBIOS host name: The NetBIOS name of a host (as specified in [RFC1001] section 14 and [RFC1002] section 4), with the extensions described in [MS-NBTE].

object: A set of attributes (1), each with its associated values. Two attributes of an object have special significance: an identifying attribute and a parent-identifying attribute. An identifying attribute is a designated single-valued attribute that appears on every object; the value of this attribute identifies the object. For the set of objects in a replica, the values of the identifying attribute are distinct. A parent-identifying attribute is a designated single-valued attribute that appears on every object; the value of this attribute identifies the object's parent. That is, this attribute contains the value of the parent's identifying attribute, or a reserved value identifying no object. For the set of objects in a replica, the values of this parent-identifying attribute define a tree with objects as vertices and child-parent references as directed edges with the child as an edge's tail and the parent as an edge's head. Note that an object is a value, not a variable; a replica is a variable. The process of adding, modifying, or deleting an object in a replica replaces the entire value of the replica with a new value. As the word replica suggests, it is often the case that two replicas contain "the same objects". In this usage, objects in two replicas are considered the same if they have the same value of the identifying attribute and if there is a process in place (replication) to converge the values of the remaining attributes. When the members of a set of replicas are considered to be the same, it is common to say "an object" as shorthand referring to the set of corresponding objects in the replicas.

object store: A system that provides the ability to create, query, modify, or apply policy to a local resource on behalf of a remote client. The object store is backed by a file system, a named pipe, or a print job that is accessed as a file.

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opnum: An operation number or numeric identifier that is used to identify a specific **remote procedure call (RPC)** method or a method in an interface. For more information, see [C706] section 12.5.2.12 or [MS-RPCE].

primary domain controller (PDC): A **domain controller (DC)** designated to track changes made to the accounts of all computers on a **domain**. It is the only computer to receive these changes directly, and is specialized so as to ensure consistency and to eliminate the potential for conflicting entries in the **Active Directory** database. A **domain** has only one **PDC**.

relative distinguished name (RDN): An attribute-value pair used in the distinguished name of an object. For more information, see [RFC2251].

remote procedure call (RPC): A context-dependent term commonly overloaded with three meanings. Note that much of the industry literature concerning RPC technologies uses this term interchangeably for any of the three meanings. Following are the three definitions: (*) The runtime environment providing remote procedure call facilities. The preferred usage for this meaning is "RPC runtime". (*) The pattern of request and response message exchange between two parties (typically, a client and a server). The preferred usage for this meaning is "RPC exchange". (*) A single message from an exchange as defined in the previous definition. The preferred usage for this term is "RPC message". For more information about RPC, see [C706].

reparse point: An attribute that can be added to a file to store a collection of user-defined data that is opaque to NTFS or ReFS. If a file that has a reparse point is opened, the open will normally fail with STATUS_REPARSE, so that the relevant file system filter driver can detect the open of a file associated with (owned by) this reparse point. At that point, each installed filter driver can check to see if it is the owner of the reparse point, and, if so, perform any special processing required for a file with that reparse point. The format of this data is understood by the application that stores the data and the file system filter that interprets the data and processes the file. For example, an encryption filter that is marked as the owner of a file's reparse point could look up the encryption key for that file. A file can have (at most) 1 reparse point associated with it. For more information, see [MS-FSCC].

RPC transport: The underlying network services used by the remote procedure call (RPC) runtime for communications between network nodes. For more information, see [C706] section 2.

Server Message Block (SMB): A protocol that is used to request file and print services from server systems over a network. The SMB protocol extends the CIFS protocol with additional security, file, and disk management support. For more information, see [CIFS] and [MS-SMB].

share: A resource offered by a Common Internet File System (CIFS) server for access by CIFS clients over the network. A **share** typically represents a directory tree and its included files (referred to commonly as a "disk share" or "file share") or a printer (a "print share"). If the information about the **share** is saved in persistent store (for example, Windows registry) and reloaded when a file server is restarted, then the **share** is referred to as a "sticky share". Some **share** names are reserved for specific functions and are referred to as special **shares**: IPC$, reserved for interprocess communication, ADMIN$, reserved for remote administration, and A$, B$, C$ (and other local disk names followed by a dollar sign), assigned to local disk devices.

share name: The name of a **share**.

site: A collection of one or more well-connected (reliable and fast) TCP/IP subnets. By defining **sites** (represented by site objects) an administrator can optimize both **Active Directory** access and **Active Directory** replication with respect to the physical network. When users log in, **Active Directory** clients find **domain controllers (DCs)** that are in the same **site** as the user, or near the same **site** if there is no **DC** in the **site**. See also Knowledge Consistency Checker (KCC). For more information, see [MS-ADTS].

site cost: An administrator-defined numerical value meant to indicate the bandwidth or actual monetary cost of transmitting data between two **sites**. Only a comparison between two site cost values is meaningful, with a lower **site** preferred to a higher site cost.

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stand-alone DFS namespace: A **DFS namespace** that has **DFS metadata** stored locally on the host server. The path to access the **DFS root** or a **DFS link** starts with the **DFS root target host name**. A **stand-alone DFS namespace** has only one **DFS root target**. Stand-alone **DFS roots** are not fault-tolerant; when the **DFS root target** is unavailable, the entire **DFS namespace** is inaccessible. Stand-alone **DFS roots** can be made fault-tolerant by being created on clustered file servers.

system access control list (SACL): An **access control list (ACL)** that controls the generation of audit messages for attempts to access a securable object. The ability to get or set an object's **SACL** is controlled by a privilege typically held only by system administrators.

Unicode: A character encoding standard developed by the Unicode Consortium that represents almost all of the written languages of the world. The **Unicode** standard [UNICODE5.0.0/2007] provides three forms (UTF-8, UTF-16, and UTF-32) and seven schemes (UTF-8, UTF-16, UTF-16 BE, UTF-16 LE, UTF-32, UTF-32 LE, and UTF-32 BE).

Universal Naming Convention (UNC): A string format that specifies the location of a resource. For more information, see [MS-DTYP] section 2.2.57.

universally unique identifier (UUID): A 128-bit value. UUIDs can be used for multiple purposes, from tagging objects with an extremely short lifetime, to reliably identifying very persistent objects in cross-process communication such as client and server interfaces, manager entry-point vectors, and **RPC** objects. UUIDs are highly likely to be unique. UUIDs are also known as **globally unique identifiers (GUIDs)** and these terms are used interchangeably in the Microsoft protocol technical documents (TDs). Interchanging the usage of these terms does not imply or require a specific algorithm or mechanism to generate the UUID. Specifically, the use of this term does not imply or require that the algorithms described in [RFC4122] or [C706] must be used for generating the UUID.

well-known endpoint: A preassigned, network-specific, stable address for a particular client/server instance. For more information, see [C706].

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as defined in [RFC2119]. All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the Errata.

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.

[C706] The Open Group, "DCE 1.1: Remote Procedure Call", C706, August 1997, https://www2.opengroup.org/ogsys/catalog/c706

[MS-ADA2] Microsoft Corporation, "Active Directory Schema Attributes M".

[MS-ADA3] Microsoft Corporation, "Active Directory Schema Attributes N-Z".

[MS-ADSC] Microsoft Corporation, "Active Directory Schema Classes".

[MS-ADTS] Microsoft Corporation, "Active Directory Technical Specification".

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[MS-DFSC] Microsoft Corporation, "Distributed File System (DFS): Referral Protocol".

[MS-DTYP] Microsoft Corporation, "Windows Data Types".

[MS-ERREF] Microsoft Corporation, "Windows Error Codes".

[MS-RPCE] Microsoft Corporation, "Remote Procedure Call Protocol Extensions".

[MS-SMB2] Microsoft Corporation, "Server Message Block (SMB) Protocol Versions 2 and 3".

[MS-SMB] Microsoft Corporation, "Server Message Block (SMB) Protocol".

[MS-SRVS] Microsoft Corporation, "Server Service Remote Protocol".

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, http://www.rfc-editor.org/rfc/rfc2119.txt

[RFC2251] Wahl, M., Howes, T., and Kille, S., "Lightweight Directory Access Protocol (v3)", RFC 2251, December 1997, http://www.ietf.org/rfc/rfc2251.txt

[RFC4122] Leach, P., Mealling, M., and Salz, R., "A Universally Unique Identifier (UUID) URN Namespace", RFC 4122, July 2005, http://www.ietf.org/rfc/rfc4122.txt

[UNICODE] The Unicode Consortium, "The Unicode Consortium Home Page", 2006, http://www.unicode.org/

[X680] ITU-T, "Abstract Syntax Notation One (ASN.1): Specification of Basic Notation", Recommendation X.680, July 2002, http://www.itu.int/rec/T-REC-X.680/en

[XMLSCHEMA] World Wide Web Consortium, "XML Schema", September 2005, http://www.w3.org/2001/XMLSchema

[XML] World Wide Web Consortium, "Extensible Markup Language (XML) 1.0 (Fourth Edition)", W3C Recommendation 16 August 2006, edited in place 29 September 2006, http://www.w3.org/TR/2006/REC-xml-20060816/

1.2.2 Informative References

[MSDFS] Microsoft Corporation, "How DFS Works", March 2003, http://technet.microsoft.com/en-us/library/cc782417%28WS.10%29.aspx

[RFC1034] Mockapetris, P., "Domain Names - Concepts and Facilities", STD 13, RFC 1034, November 1987, http://www.ietf.org/rfc/rfc1034.txt

[RFC2165] Veizades, J., Guttman, E., Perkins, C., and Kaplan, S., "Service Location Protocol", RFC 2165, June 1997, http://www.ietf.org/rfc/rfc2165.txt

[RFC2518] Goland, Y., Whitehead, E., Faizi, A., et al., "HTTP Extensions for Distributed Authoring - WebDAV", RFC 2518, February 1999, http://www.ietf.org/rfc/rfc2518.txt

[RFC3530] Shepler, S., et al., "Network File System (NFS) version 4 Protocol", RFC 3530, April 2003, http://www.ietf.org/rfc/rfc3530.txt

1.3 Overview

The DFS: Namespace Management Protocol is one of a collection of protocols that group shares that are located on different servers by combining various storage media into a single logical namespace. The **DFS namespace** is a virtual view of the **share**. When a user views the namespace, the

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directories and files in it appear to reside on a single share. Users can navigate the namespace without needing to know the server names or shares hosting the data. DFS also provides redundancy of namespace service.

Access to a DFS namespace requires the **DFS client**. The DFS client uses the **DFS Referral** Protocol, as specified in [MS-DFSC], to ascertain the existence of the DFS namespace and to determine the shares to access on servers that participate in the DFS namespace. The DFS Referral Protocol navigates through the DFS namespace by appropriately issuing referral requests to a **domain controller (DC)** or to a **DFS root target** server to resolve the original path to a share on a server that contains the data being accessed. For more information on DFS and the DFS client, see [MSDFS]. For more information on how the DFS Referral Protocol operates within the context of the **Server Message Block (SMB)** Protocol, as specified in [MS-SMB], which is the transport for DFS referrals, see [MS-DFSC] section 2.

DFS namespace information, such as name, **DFS link** name, **DFS link target**, and so on, is stored in the **DFS metadata** of the namespace. Depending on where the DFS metadata is stored, the DFS namespace is "domain-based" or "stand-alone".

- **Domain-Based DFS Namespace**: A well-known container in the domain directory, known as the DFS configuration container, holds the DFS metadata for a domain-based DFS namespace. An **object** exists for each domain-based DFS namespace in the DFS configuration container. DFS metadata of a domain-based DFS namespace is stored as a **binary large object (BLOB)** in an attribute of the DFS namespace object. A domain-based DFS namespace can have multiple DFS root targets, which offer high availability and load sharing at the DFS root level. The **DFS root** name of a domain-based DFS namespace has the **domain** as its first component. A DFS client issues a referral request to a DC in order to identify the DFS root targets of the DFS namespace.

- **Stand-Alone DFS Namespace**: DFS metadata is stored in an implementation-specific format on the DFS root target server itself. A stand-alone DFS namespace supports only one DFS root target. The DFS root name of a stand-alone DFS namespace has a **host name** as its first component. A DFS client issues referral requests to the DFS root target server to access the DFS namespace. A stand-alone DFS namespace may be clustered to provide high availability of the DFS namespace.<1> The server hosting a stand-alone DFS namespace can be promoted to a Domain Controller, but the namespace cannot be converted to a domain-based namespace, and it will continue as a stand-alone namespace.

  A server cannot host both domain-based and stand-alone namespace roots with the same name.

The DFS: Namespace Management Protocol is used to configure DFS services. This protocol is used primarily by administrative applications that run on client computers to connect and configure **Distributed File System (DFS) servers**. It consists of the RPC methods that can be issued from an administrative client computer to the protocol server on a DC or a Distributed File System (DFS) root target server. An administrator can use this protocol to perform various Distributed File System (DFS) namespace administration operations, such as creating or deleting a DFS namespace, adding or removing DFS root targets, adding or removing DFS links, and adding or removing targets to an existing link. The DFS: Namespace Management Protocol includes the following:

- Eleven basic methods for configuring **stand-alone DFS namespaces** and **domain-based DFS namespaces**, as specified in section 3.1.4.1.

- Four methods that support extended access to configurations of a DFS namespace, as specified in section 3.1.4.2.

- Three methods for configuring root targets in a **domainv1-based DFS namespace**, as specified in section 3.1.4.3.

- Three methods for configuring a stand-alone DFS namespace, as specified in section 3.1.4.4.

- Two methods relating to the association between a **DFS server** and the DC used by a domain-based DFS namespace, as specified in section 3.1.4.5.

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Much of the configuration information that is communicated through this protocol is marshaled through two unions: DFS_INFO_STRUCT and DFS_INFO_ENUM_STRUCT. The usage model of these unions is for the client to specify a *Level* parameter to determine which union case to use. Each level corresponds to a specific DFS_INFO_*n* structure, where *n* is the level number. Arrays of DFS_INFO_*n* structures are marshaled using DFS_INFO_*n*_CONTAINER structures. Levels 1, 2, 3, 4, 5, 6, 8, and 9 are common, and are shared across both the DFS_INFO_STRUCT and DFS_INFO_ENUM_STRUCT unions. Levels 7, 50, 100, 101, 102, 103, 104, 105, 106, 107, and 150 are unique to the DFS_INFO_STRUCT union, and Levels 200 and 300 are unique to the DFS_INFO_ENUM_STRUCT union.

While a number of methods use the common configuration information structures, not all methods support all levels. The following table lists the levels used in the DFS_INFO_STRUCT and DFS_INFO_ENUM_STRUCT unions, their singleton and array structures, and the methods with which the level can be used.

Level	Structure	Array structure	NetrDfs GetInfo	NetrDfs Enum	NetrDfs SetInfo	NetrDfs SetInfo2	NetrDfs EnumEx
1	DFS_INFO_1	DFS_INFO_1_ CONTAINER	X	X			X
2	DFS_INFO_2	DFS_INFO_2_ CONTAINER	X	X			X
3	DFS_INFO_3	DFS_INFO_3_ CONTAINER	X	X			X
4	DFS_INFO_4	DFS_INFO_4_ CONTAINER	X	X			X
5	DFS_INFO_5	DFS_INFO_5_ CONTAINER	X	X			X
6	DFS_INFO_6	DFS_INFO_6_ CONTAINER	X	X			X
7	DFS_INFO_7	N/A	X				
8	DFS_INFO_8	DFS_INFO_8_ CONTAINER	X	X			X
9	DFS_INFO_9	DFS_INFO_9_ CONTAINER	X	X			X
50	DFS_INFO_50	N/A	X				
100	DFS_INFO_100	N/A	X		X	X	
101	DFS_INFO_101	N/A			X	X	
102	DFS_INFO_102	N/A			X	X	
103	DFS_INFO_103	N/A			X	X	
104	DFS_INFO_104	N/A			X	X	
105	DFS_INFO_105	N/A			X	X	
106	DFS_INFO_106	N/A			X	X	
107	DFS_INFO_107	N/A			X	X	

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Level	Structure	Array structure	NetrDfs GetInfo	NetrDfs Enum	NetrDfs SetInfo	NetrDfs SetInfo2	NetrDfs EnumEx
150	DFS_INFO_150	N/A	X		X	X	
200	DFS_INFO_200	DFS_INFO_200_CONTAINER					X
300	DFS_INFO_300	DFS_INFO_300_CONTAINER		X			X

1.4 Relationship to Other Protocols

The DFS: Namespace Management Protocol is used to configure and administer DFS namespaces. It depends on RPC for its transport.

The DFS: Namespace Management Protocol is the recommended method of performing DFS namespace operations. This protocol is used in many operations (for example, creating a new DFS namespace or adding or removing DFS links or DFS link targets). All of these operations require updating the DFS metadata of a DFS namespace.

The DFS Referral Protocol, as specified in [MS-DFSC], accesses the DFS metadata of a DFS namespace for providing DFS referral responses. The DFS clients issue DFS referral requests to verify the existence of a DFS namespace and to identify the targets of a **DFS path**, as specified in [MS-DFSC]. The DFS Referral Protocol permits DFS clients to navigate the DFS namespace and to locate the share on a server that contains the required data. The DFS Referral Protocol is implemented as a set of SMB Protocol extensions to commands, such as TRANS2_GET_DFS_REFERRAL to request DFS referrals from DCs, as specified in [MS-SMB].

After a DFS path is resolved to a **DFS target** by using the DFS Referral Protocol, a client accesses resources on the server identified by the DFS target by using a resource access protocol, such as the following:

- SMB, as specified in [MS-SMB].
- SMB2, as specified in [MS-SMB2].
- Network File System (NFS), as specified in [RFC3530].
- Network Control Protocol (NCP), as specified in [NOVELL].
- Web Distributed Authoring and Versioning (WebDAV), as specified in [RFC2518].

A resource access protocol implementation uses name resolution protocols, such as DNS (as specified in [RFC1034]) or SLP (as specified in [RFC2165]), to resolve DFS target host names.

The DFS metadata of a domain-based DFS namespace is stored in Directory Services. A DFS server uses the **Lightweight Directory Access Protocol (LDAP)**, as specified in [RFC2251], to access the DFS metadata from the DS for use with both the DFS: Namespace Management Protocol and the DFS Referral Protocol.

1.5 Prerequisites/Preconditions

The DFS: Namespace Management Protocol is an RPC interface and, as a result, has prerequisites common to RPC interfaces. These prerequisites are specified in [MS-RPCE].

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Before a client invokes this protocol, it must obtain the name of a server that supports DFS services and RPC.

To avoid conflicts between updates to DFS metadata:

- At most, one client can modify the metadata for a given DFS namespace at a time.
- A domain-based DFS server must perform all DFS metadata updates to the **primary domain controller (PDC)** independently of the **DFS root scalability mode** setting of the DFS namespace.<2>

1.6 Applicability Statement

The DFS: Namespace Management Protocol is appropriate for managing a domain-based DFS namespace or a stand-alone DFS namespace.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- Supported transports: The DFS: Namespace Management Protocol uses RPC over SMB1.*x* or SMB2 as its only supported transport. For more information on transport specifications, see section 2.1.
- Protocol versions: The RPC interface for this protocol has a single version number of 3.0. This protocol can be extended without altering the version number by adding RPC methods to the interface, with **opnums** positioned numerically beyond those defined in this specification. A client determines whether such methods are supported by attempting to invoke the method; if the method is not supported, the RPC server returns an "opnum out of range" error. RPC versioning and capacity negotiation in this situation is specified in [C706] and [MS-RPCE].<3>
- Security and authentication methods: As specified in [MS-RPCE].
- Capability negotiation: None.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

No standards assignments have been received for the RPC interface **UUID** or for the well-known pipe name described in this document. All values used in these extensions are in private ranges, as specified in [MS-RPCE] and [MS-SMB].

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2 Messages

2.1 Transport

The DFS root target MUST reside on a server that is accessible through SMB (as specified in [MS-SMB]) or SMB2 (as specified in [MS-SMB2]). A link target can reside on a server that is accessible through any resource access protocol for which appropriate client-side software exists.

The DFS: Namespace Management Protocol uses RPC over SMB, as specified in [MS-RPCE].

This protocol uses a **well-known endpoint**, `\\PIPE\NETDFS`, for RPC over SMB. The RPC interface uses transport-level authentication, as specified in [MS-RPCE]. DFS is not directly involved in authentication; however, the DFS service MUST verify whether the user has administrator privileges to the namespace. The authenticated RPC interface allows RPC to negotiate the use of authentication and the **authentication level** on behalf of the client and server, as specified in [MS-RPCE] section 3.3.1.5.2. The server MUST find the security context indicated by the auth_context_id in the sec_trailer of the request, and it MUST ask the security provider that created the security context to retrieve the client identity.

This protocol MUST use the universally unique identifier (UUID) 4FC742E0-4A10-11CF-8273-00AA004AE673. The RPC version number is 3.0.

This protocol allows any user to establish a connection to a DFS server. It uses the underlying RPC protocol to retrieve the identity of the caller that made the request, as specified in [MS-RPCE] section 3.3.3.4.3. The RPC server SHOULD use this identity to verify method-specific access.

2.2 Common Data Types

2.2.1 Common Conventions

Unless otherwise specified, all strings in this protocol are null-terminated strings of UTF-16, as specified in [UNICODE] characters. Backslashes (\) in string descriptions are literal characters.

Constructs of the form "<value>" in strings are placeholders to be replaced with client-specified or server-specified values. For example, the string description "\\<servername>\<share>" would take the form "\\myserver\myshare" when populated with the values "myserver" for the <servername> placeholder and "myshare" for the <share> placeholder.

A number of string formats are common to many of the data types and methods in this protocol. To avoid repetition, this section describes the specific formats.

2.2.1.1 Host Name

A host name represents the host name of a server or the domain name of a domain hosting resource as specified in [MS-DTYP] section 2.2.57.

2.2.1.2 Share Name

Unless specified otherwise, a **share name** is a null-terminated **Unicode** character string whose format depends on the actual file server protocol used to access the share as specified in [MS-DTYP] section 2.2.57.

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2.2.1.3 Domain Name

Unless specified otherwise, a domain name is a null-terminated Unicode character string consisting of the name of a Directory Service domain. For more details, see [MS-DTYP] section 2.2.57.

2.2.1.4 UNC Path

A Universal Naming Convention (UNC) path, as specified in [MS-DTYP] section 2.2.57, can be used to access network resources.

2.2.1.5 DFS Root

A DFS root has one of the following **UNC** path formats.

```
\\<ServerName>\<DFSName>
\\<DomainName>\<DFSName>
```

where:

- <ServerName> is the host name (as specified in section 2.2.1.1) of a DFS root target (as specified in section 2.2.1.7) of the DFS namespace.
- <DomainName> is the domain name (as specified in section 2.2.1.3) of the domain hosting the domain-based DFS namespace.
- <DFSName> is the **DFS namespace name**. A stand-alone DFS namespace can be referred to only by the first format. A domain-based DFS namespace can be referred to in either format, with the second format preferred.

2.2.1.6 DFS Link

A DFS link has one of the following UNC path formats.

```
\\<ServerName>\<DFSName>\<LinkPath>
\\<DomainName>\<DFSName>\<LinkPath>
```

where:

- <ServerName> is the host name of a DFS root target of the DFS namespace.
- <DomainName> is the domain name of the domain hosting the domain-based DFS namespace.
- <DFSName> is the DFS namespace name.
- <LinkPath> is the path of the DFS link relative to the DFS root target share. A stand-alone DFS namespace can be referred to only by the first format. A domain-based DFS namespace can be referred to in either format, with the second format preferred.

2.2.1.7 DFS Root Target

A DFS root target is a UNC path with the following format.

```
\\<servername>\<sharename>
```


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where:

- <servername> is the host name of a DFS root target server.
- <sharename> is the share name corresponding to a DFS namespace on the DFS root target server.

2.2.1.8 DFS Link Target

A DFS link target is any UNC path that resolves to a directory.

2.2.1.9 DFS Target

A DFS target is either a DFS root target or a DFS link target.

2.2.2 Common Data Types

In addition to RPC base types and definitions, as specified in [C706] and [MS-RPCE], the following sections use the definitions of DWORD, **GUID**, and WCHAR, as specified in [MS-DTYP] DWORD section 2.2.9, GUID section 2.3.4.2, and WCHAR section 2.2.60. Any remaining data types in this section are defined in the **Interface Definition Language (IDL)** specification for this RPC interface.

This protocol MUST enable the ms_union extension as specified in [MS-RPCE], section 2.2.4.

2.2.2.1 NET_API_STATUS

The NET_API_STATUS type is an unsigned, 32-bit integer value representing the return code from an RPC method.

This type is declared as follows:

```
typedef DWORD NET_API_STATUS;
```

This protocol uses Microsoft Win32 error codes. The values are taken from the Windows error number space, as specified in [MS-ERREF]. Vendors SHOULD reuse those values with their indicated meanings. Choosing any other value creates the risk of collisions in the future.

2.2.2.2 NETDFS_SERVER_OR_DOMAIN_HANDLE

The NETDFS_SERVER_OR_DOMAIN_HANDLE is a pointer to a Unicode string representing a host name for an RPC method.

This type is declared as follows:

```
typedef WCHAR* NETDFS_SERVER_OR_DOMAIN_HANDLE;
```

2.2.2.3 DFS_INFO_STRUCT

The DFS_INFO_STRUCT union relates to the NetrDfsGetInfo, NetrDfsSetInfo, and NetrDfsSetInfo2 methods when used to retrieve or set the configuration of the DFS server. The usage model of this union is for the client to specify a *Level* parameter to determine which case of the DFS_INFO_STRUCT to use.

The DFS_INFO_STRUCT union has the following format.

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```
typedef
[switch_type(unsigned long)]
union _DFS_INFO_STRUCT {
  [case(1)]
    DFS_INFO_1* DfsInfo1;
  [case(2)]
    DFS_INFO_2* DfsInfo2;
  [case(3)]
    DFS_INFO_3* DfsInfo3;
  [case(4)]
    DFS_INFO_4* DfsInfo4;
  [case(5)]
    DFS_INFO_5* DfsInfo5;
  [case(6)]
    DFS_INFO_6* DfsInfo6;
  [case(7)]
    DFS_INFO_7* DfsInfo7;
  [case(8)]
    DFS_INFO_8* DfsInfo8;
  [case(9)]
    DFS_INFO_9* DfsInfo9;
  [case(50)]
    DFS_INFO_50* DfsInfo50;
  [case(100)]
    DFS_INFO_100* DfsInfo100;
  [case(101)]
    DFS_INFO_101* DfsInfo101;
  [case(102)]
    DFS_INFO_102* DfsInfo102;
  [case(103)]
    DFS_INFO_103* DfsInfo103;
  [case(104)]
    DFS_INFO_104* DfsInfo104;
  [case(105)]
    DFS_INFO_105* DfsInfo105;
  [case(106)]
    DFS_INFO_106* DfsInfo106;
  [case(107)]
    DFS_INFO_107* DfsInfo107;
  [case(150)]
    DFS_INFO_150* DfsInfo150;
  [default]     ;
} DFS_INFO_STRUCT;
```

DfsInfo1: The DFS_INFO_1 structure contains the name of a DFS root or DFS link. For more information on the specifications, see section 2.2.3.1.

DfsInfo2: The DFS_INFO_2 structure contains information for a DFS root or DFS link. For more information on specifications, see section 2.2.3.2.

DfsInfo3: The DFS_INFO_3 structure contains information for a DFS root or DFS link. For more information on specifications, see section 2.2.3.3.

DfsInfo4: The DFS_INFO_4 structure contains information for a DFS root or DFS link. For more information on specifications, see section 2.2.3.4.

DfsInfo5: The DFS_INFO_5 structure contains information for a DFS root or DFS link. For more information on specifications, see section 2.2.3.5.

DfsInfo6: The DFS_INFO_6 structure contains information for a DFS root or DFS link. For more information on specifications, see section 2.2.3.6.

DfsInfo7: The DFS_INFO_7 structure contains information about a DFS root or DFS link. For more information on specifications, see section 2.2.3.7.

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DfsInfo8: The DFS_INFO_8 structure contains information about a DFS root or DFS link. For more information on specifications, see section 2.2.3.8.

DfsInfo9: The DFS_INFO_9 structure contains information about a DFS root or DFS link. For more information on specifications, see section 2.2.3.9.

DfsInfo50: The DFS_INFO_50 structure contains information about a DFS root or DFS link. For more information on specifications, see section 2.2.3.10.

DfsInfo100: The DFS_INFO_100 structure contains a comment associated with a DFS root or DFS link. For more information on specifications, see section 2.2.5.1.

DfsInfo101: The DFS_INFO_101 structure describes the storage state on a DFS root, DFS link, DFS root target, or DFS link target. For more information on specifications, see section 2.2.4.1.

DfsInfo102: The DFS_INFO_102 structure contains a time-out value for a DFS root or DFS link. For more information on specifications, see section 2.2.4.2.

DfsInfo103: The DFS_INFO_103 structure contains properties that set specific behaviors for a DFS root or DFS link. For more information on specifications, see section 2.2.4.3.

DfsInfo104: The DFS_INFO_104 structure contains the priority of a DFS root target or DFS link target. For more information on specifications, see section 2.2.4.4.

DfsInfo105: The DFS_INFO_105 structure contains information about a DFS root or DFS link, including comment, state, time-out, and DFS behaviors that property flags specify. For more information on specifications, see section 2.2.4.5.

DfsInfo106: The DFS_INFO_106 structure contains the storage state and priority for a DFS root target or DFS link target. For more information on specifications, see section 2.2.4.6.

DfsInfo107: The DFS_INFO_107 structure contains the storage state and priority for a DFS root target or DFS link target. For more information on specifications, see section 2.2.4.7.

DfsInfo150: The DFS_INFO_150 structure contains the self-relative security descriptor associated with the DFS link. For more information on specifications, see section 2.2.5.2.

2.2.2.4 DFS_INFO_ENUM_STRUCT

The DFS_INFO_ENUM_STRUCT union relates to the NetrDfsEnum and NetrDfsEnumEx methods when used to enumerate the configuration of the DFS server.

The DFS_INFO_ENUM_STRUCT union structure has the following format.

```
typedef struct _DFS_INFO_ENUM_STRUCT {
  DWORD Level;
  [switch_is(Level)] union {
    [case(1)]
      DFS_INFO_1_CONTAINER* DfsInfo1Container;
    [case(2)]
      DFS_INFO_2_CONTAINER* DfsInfo2Container;
    [case(3)]
      DFS_INFO_3_CONTAINER* DfsInfo3Container;
    [case(4)]
      DFS_INFO_4_CONTAINER* DfsInfo4Container;
    [case(5)]
      DFS_INFO_5_CONTAINER* DfsInfo5Container;
    [case(6)]
      DFS_INFO_6_CONTAINER* DfsInfo6Container;
    [case(8)]
      DFS_INFO_8_CONTAINER* DfsInfo8Container;
    [case(9)]
```


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```
      DFS_INFO_9_CONTAINER* DfsInfo9Container;
    [case(200)]
      DFS_INFO_200_CONTAINER* DfsInfo200Container;
    [case(300)]
      DFS_INFO_300_CONTAINER* DfsInfo300Container;
  } DfsInfoContainer;
} DFS_INFO_ENUM_STRUCT;
```

Level: Specifies the case of the **DfsInfoContainer** union.

DfsInfoContainer: Union of the possible enumeration containers.

DfsInfo1Container: The DFS_INFO_1_CONTAINER structure contains an array of the names of DFS roots or DFS links. For more information, see section 2.2.6.1.

DfsInfo2Container: The DFS_INFO_2_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.2.

DfsInfo3Container: The DFS_INFO_3_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.3.

DfsInfo4Container: The DFS_INFO_4_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.4.

DfsInfo5Container: The DFS_INFO_5_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.5.

DfsInfo6Container: The DFS_INFO_6_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.6.

DfsInfo8Container: The DFS_INFO_8_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.7.

DfsInfo9Container: The DFS_INFO_9_CONTAINER structure contains an array of information for DFS roots or DFS links. For more information, see section 2.2.6.8.

DfsInfo200Container: The DFS_INFO_200_CONTAINER structure contains an array of the names of domain-based DFS namespaces in a domain-based DFS. For more information, see section 2.2.6.9.

DfsInfo300Container: The DFS_INFO_300_CONTAINER structure contains an array of the DFS roots hosted on a server. For more information, see section 2.2.6.10.

2.2.2.5 DFS_STORAGE_INFO

The DFS_STORAGE_INFO structure relates to the NetrDfsEnum, NetrDfsEnumEx, and NetrDfsGetInfo methods when used to enumerate DFS links and DFS targets in a namespace or to get information about a DFS link. The structure contains information about the target of a DFS root or DFS link.

The DFS_STORAGE_INFO structure has the following format.

```
typedef struct  DFS_STORAGE_INFO {
  unsigned long State;
  [string] WCHAR* ServerName;
  [string] WCHAR* ShareName;
} DFS_STORAGE_INFO;
```

State: Refers to the **State** field of DFS_INFO_106. For more information, see section 2.2.4.6.

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ServerName: The pointer to a null-terminated Unicode string containing the DFS target host name.

ShareName: The pointer to a null-terminated Unicode string containing the DFS target share name.

DFS_INFO_3 and DFS_INFO_4 structures contain one or more DFS_STORAGE_INFO structures, one for each DFS target.

2.2.2.6 DFS_STORAGE_INFO_1

The DFS_STORAGE_INFO_1 structure relates to the NetrDfsEnum, NetrDfsEnumEx, and NetrDfsGetInfo methods when used to enumerate DFS links and targets in a namespace or to get information about a DFS link. The structure contains data about a DFS target, including the host name and share name, as well as the target state and priority. For more information on prioritization, see section 2.2.2.7.

The DFS_STORAGE_INFO_1 structure has the following format.

```
typedef struct _DFS_STORAGE_INFO_1 {
  unsigned long State;
  [string] WCHAR* ServerName;
  [string] WCHAR* ShareName;
  DFS_TARGET_PRIORITY TargetPriority;
} DFS_STORAGE_INFO_1,
 *PDFS_STORAGE_INFO_1,
 *LPDFS_STORAGE_INFO_1;
```

State: Refers to the State field of DFS_INFO_106. For more information, see section 2.2.4.6.

ServerName: A pointer to a null-terminated Unicode string containing the DFS target host name.

ShareName: A pointer to a null-terminated Unicode string containing the DFS target share name.

TargetPriority: A DFS_TARGET_PRIORITY structure containing the priority class and priority rank.

2.2.2.7 DFS_TARGET_PRIORITY

The DFS_TARGET_PRIORITY structure relates to the NetrDfsSetInfo and NetrDfsSetInfo2 methods when used to set the priority of a DFS target in referrals from a server. It also relates to the DFS_STORAGE_INFO_1 structure that the NetrDfsEnum, NetrDfsEnumEx, and NetrDfsGetInfo methods return. The structure defines the priority of a DFS target. The DFS targets can be prioritized independently of **site cost**. The DFS target priority is manually assigned to link targets and root targets and allows for load balancing of clients.

The DFS_TARGET_PRIORITY structure has the following format.

```
typedef struct _DFS_TARGET_PRIORITY {
  DFS_TARGET_PRIORITY_CLASS TargetPriorityClass;
  unsigned short TargetPriorityRank;
  unsigned short Reserved;
} DFS_TARGET_PRIORITY;
```

TargetPriorityClass: The DFS_TARGET_PRIORITY_CLASS enumeration value that specifies the priority class of the target. For more information, see section 2.2.2.8.

TargetPriorityRank: The priority rank of the target, ranging in value from 0x0000 to 0x001F, where 0x0000 is the highest rank. Priority ranks apply only within a priority class, not across priority classes.

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Reserved: MUST be set to 0 by the sender and ignored by the receiver.

2.2.2.8 DFS_TARGET_PRIORITY_CLASS

The DFS_TARGET_PRIORITY_CLASS enumeration relates to the NetrDfsSetInfo and NetrDfsSetInfo2 methods when used to set the priority of DFS targets in referrals from a server. For more information on prioritization, see section 2.2.2.7. The enumeration defines five possible DFS target priority class settings.

```
typedef [v1 enum] enum  DFS TARGET PRIORITY CLASS
{
  DfsInvalidPriorityClass = -1,
  DfsSiteCostNormalPriorityClass = 0,
  DfsGlobalHighPriorityClass = 1,
  DfsSiteCostHighPriorityClass = 2,
  DfsSiteCostLowPriorityClass = 3,
  DfsGlobalLowPriorityClass = 4
} DFS_TARGET_PRIORITY_CLASS;
```

DfsInvalidPriorityClass: This is not a valid priority class.

DfsSiteCostNormalPriorityClass: The default or "normal" site cost priority class for a DFS target.

DfsGlobalHighPriorityClass: The highest priority class for a DFS target. Targets assigned to this class receive global preference.

DfsSiteCostHighPriorityClass: The highest site cost priority class for a DFS target. Targets assigned to this class receive the highest preference among targets of the same site cost for a given DFS client.

DfsSiteCostLowPriorityClass: The lowest site cost priority class for a DFS target. Targets assigned to this class receive the least preference among targets of the same site cost for a given DFS client.

DfsGlobalLowPriorityClass: The lowest priority class level for a DFS target. Targets assigned to this class receive the least preference globally.

The underlying data type of this enumeration is long integer.

The order of priority classes, from highest to lowest, is as follows:

- DfsGlobalHighPriorityClass
- DfsSiteCostHighPriorityClass
- DfsSiteCostNormalPriorityClass
- DfsSiteCostLowPriorityClass
- DfsGlobalLowPriorityClass

Server targets are initially grouped into global high-priority, normal-priority, and global low-priority classes. The normal-priority class is then subdivided, based on site cost, into site cost high-priority, site cost normal-priority, and site-cost low-priority classes.

For example, all server targets with a site cost value of 0 are grouped into site cost high-priority, normal-priority, and low-priority classes. Then, all server targets with higher site costs are likewise separated into site cost high-priority, normal-priority, and low-priority classes. Thus, a server target with a site cost value of 0 and a site cost low-priority class is still ranked higher than a server target with a site cost value of 1 and a site cost high-priority class.

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Be aware that the value for a "normal-priority class" is set to 0 even though it is lower in priority than DfsGlobalHighPriorityClass and DfsSiteCostHighPriorityClass. This is the default priority class setting. For added granularity, priority rank can be used to discriminate within a priority class.

2.2.2.9 DFSM_ROOT_LIST

The DFSM_ROOT_LIST structure relates to the NetrDfsAdd2, NetrDfsAddFtRoot, and NetrDfsSetInfo2 methods when used to add a DFS link or a DFS root target, or to modify the configuration of a domain-based DFS namespace. The structure contains an array of DFSM_ROOT_LIST_ENTRY structures, each of which contains information about a DFS root target.

The DFSM_ROOT_LIST structure has the following format.

```
typedef struct _DFSM_ROOT_LIST {
  DWORD cEntries;
  [size_is(cEntries)] DFSM_ROOT_LIST_ENTRY Entry[];
} DFSM_ROOT_LIST;
```

cEntries: The number of DFS targets. The value of this member indicates the size of the array in the Entry member.

Entry: An array of DFSM_ROOT_LIST_ENTRY structures. Each structure provides information about one DFS target. For more information, see section 2.2.2.10.

2.2.2.10 DFSM_ROOT_LIST_ENTRY

The DFSM_ROOT_LIST_ENTRY structure relates to the NetrDfsAdd2, NetrDfsAddFtRoot, and NetrDfsSetInfo2 methods when used to add a DFS link or a DFS root target, or to modify the configuration of a domain-based DFS namespace. The structure contains information about a DFS root target.

The DFSM_ROOT_LIST_ENTRY structure has the following format.

```
typedef struct _DFSM_ROOT_LIST_ENTRY {
  [string, unique] WCHAR* ServerShare;
} DFSM_ROOT_LIST_ENTRY;
```

ServerShare: Specifies a DFS root target.

2.2.2.11 DFS_NAMESPACE_VERSION_ORIGIN

The DFS_NAMESPACE_VERSION_ORIGIN is an enumeration that relates to the NetrDfsGetSupportedNamespaceVersion method when used to determine the supported DFS metadata version number.

The DFS_NAMESPACE_VERSION_ORIGIN enumeration has the following format.

```
typedef  enum _DFS_NAMESPACE_VERSION_ORIGIN
{
  DFS_NAMESPACE_VERSION_ORIGIN_COMBINED = 0,
  DFS_NAMESPACE_VERSION_ORIGIN_SERVER,
  DFS_NAMESPACE_VERSION_ORIGIN_DOMAIN
} DFS_NAMESPACE_VERSION_ORIGIN;
```

DFS_NAMESPACE_VERSION_ORIGIN_COMBINED: This value is not used in communication.

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DFS_NAMESPACE_VERSION_ORIGIN_SERVER: The maximum version that a server can support.

DFS_NAMESPACE_VERSION_ORIGIN_DOMAIN: The maximum version that the domain can support.

2.2.2.12 DFS_SUPPORTED_NAMESPACE_VERSION_INFO

The DFS_SUPPORTED_NAMESPACE_VERSION_INFO structure relates to the NetrDfsGetSupportedNamespaceVersion method when used to determine the domain-based or standalone-based DFS major and minor version information.

The DFS_SUPPORTED_NAMESPACE_VERSION_INFO structure has the following format.

```
typedef struct _DFS_SUPPORTED_NAMESPACE_VERSION_INFO {
  unsigned long DomainDfsMajorVersion;
  unsigned long DomainDfsMinorVersion;
  ULONGLONG DomainDfsCapabilities;
  unsigned long StandaloneDfsMajorVersion;
  unsigned long StandaloneDfsMinorVersion;
  ULONGLONG StandaloneDfsCapabilities;
} DFS_SUPPORTED_NAMESPACE_VERSION_INFO,
 *PDFS_SUPPORTED_NAMESPACE_VERSION_INFO;
```

DomainDfsMajorVersion: A value containing the major version number of the DFS metadata format supported by a domain-based DFS namespace.

DomainDfsMinorVersion: A value containing the minor version number of the DFS metadata format supported by a domain-based DFS namespace.

DomainDfsCapabilities: A value containing the capability information of a domain-based DFS namespace.

StandaloneDfsMajorVersion: A value containing the major version number of a stand-alone DFS namespace.

StandaloneDfsMinorVersion: A value containing the minor version number of a stand-alone DFS namespace.

StandaloneDfsCapabilities: A value containing the capability information of a stand-alone DFS namespace.

DomainDfsCapabilities and **StandaloneDfsCapabilities** are bit fields with the following defined value.

Value	Meaning
DFS_NAMESPACE_CAPABILITY_ABDE 0x0000000000000001	This specifies support for Access Based Directory Enumeration (ABDE) mode.<4>

When this structure is used for communication, all undefined bit fields MUST be set to zero. A client SHOULD ignore all bit fields it does not understand.

2.2.2.13 DFS Volume State

The following table lists the valid states for a DFS root or a DFS link, and it relates to the **State** field of the **DFS_INFO_2**, **DFS_INFO_4**, **DFS_INFO_5**, **DFS_INFO_6**, and **DFS_INFO_8** structures. The bitmask DFS_VOLUME_STATES (0x0000000F) MUST be used to extract the state of a DFS root or a DFS link from the **State** field.

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Value	Meaning
DFS_VOLUME_STATE_OK 0x00000001	The DFS root or DFS link is initialized to this state. In this state the DFS root or link is available for referral request. This state is persisted to the DFS metadata.
RESERVED 0x00000002	This value is reserved and MUST NOT be used.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The DFS link is offline, and none of the DFS targets will be included in referral response. This flag is valid only for a DFS link and cannot be set on a DFS root. This state is persisted to the DFS metadata.
DFS_VOLUME_STATE_ONLINE 0x00000004	The DFS link is online and available for referral request. This flag is valid only for a DFS link and cannot be set on a DFS root. This state is persisted to the DFS metadata.

2.2.3 Get Info Data Types

The structures in this section relate to the NetrDfsGetInfo, NetrDfsEnum, and NetrDfsEnumEx methods when used to retrieve information about the DFS server configuration. The usage model of these structures is for the client to specify a *Level* parameter to indicate which case of the DFS_INFO_STRUCT to use.

2.2.3.1 DFS_INFO_1

The DFS_INFO_1 structure contains the name of a DFS root or DFS link.

The DFS_INFO_1 structure has the following format.

```
typedef struct _DFS_INFO_1 {
  [string] WCHAR* EntryPath;
} DFS_INFO_1;
```

EntryPath: The pointer to a DFS root or a DFS link path.

2.2.3.2 DFS_INFO_2

The DFS_INFO_2 structure contains information for a DFS root or DFS link.

The DFS_INFO_2 structure has the following format.

```
typedef struct _DFS_INFO_2 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  DWORD NumberOfStorages;
} DFS_INFO_2;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment that is used for informational purposes and is associated with the DFS root or DFS link. This string has no

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protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: This field has the state of the DFS root or DFS link. For a DFS root, this field also specifies whether the DFS namespace is stand-alone or domain-based.

The DFS_VOLUME_STATES bitmask (0x0000000F) MUST be used to extract the following DFS root or DFS link state from this field. For more information about some of these states, see section 2.2.2.13.

Value	Meaning
DFS_VOLUME_STATE_OK 0x00000001	The specified DFS root or DFS link is in the normal state.
RESERVED 0x00000002	This value is reserved and MUST NOT be used.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The DFS link is offline, and none of the DFS targets will be included in the referral response. This flag is valid only for a DFS link and cannot be set on a DFS root. This state is persisted to the DFS metadata.
DFS_VOLUME_STATE_ONLINE 0x00000004	The DFS link is online and available for referral request. This flag is valid only for a DFS link and cannot be set on a DFS root. This state is persisted to the DFS metadata.

The DFS_VOLUME_FLAVORS bitmask (0x00000300) MUST be used to extract the following DFS namespace flavor from this field.

Value	Meaning
DFS_VOLUME_FLAVOR_STANDALONE 0x00000100	Stand-alone DFS namespace.
DFS_VOLUME_FLAVOR_AD_BLOB 0x00000200	domainv1-based or **domainv2-based DFS namespace**.

NumberOfStorages: Number of DFS targets for the root or link.

2.2.3.3 DFS_INFO_3

The DFS_INFO_3 structure contains information for a DFS root or a DFS link.

The DFS_INFO_3 structure has the following format.

```
typedef struct _DFS_INFO_3 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  DWORD NumberOfStorages;
  [size_is(NumberOfStorages)] DFS_STORAGE_INFO* Storage;
} DFS_INFO_3;
```

EntryPath: Pointer to a DFS root or DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified

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restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

NumberOfStorages: The number of DFS targets for this root or link.

Storage: A pointer to an array of DFS_STORAGE_INFO structures containing information about each target. (For more information, see section 2.2.2.5). The NumberOfStorages member specifies the number of structures within this storage array.

2.2.3.4 DFS_INFO_4

The DFS_INFO_4 structure contains information for a DFS root or a DFS link.

The DFS_INFO_4 structure has the following format.

```
typedef struct _DFS_INFO_4 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  GUID Guid;
  DWORD NumberOfStorages;
  [size_is(NumberOfStorages)] DFS_STORAGE_INFO* Storage;
} DFS_INFO_4;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

Guid: The GUID of this root or link.

NumberOfStorages: The number of DFS targets for this root or link. There are no protocol-specified restrictions on the number of targets for a root or link.

Storage: A pointer to an array of DFS_STORAGE_INFO structures containing information about each target. (For more information, see section 2.2.2.5). The NumberOfStorages member specifies the number of structures within this storage array.

2.2.3.5 DFS_INFO_5

The DFS_INFO_5 structure contains information for a DFS root or a DFS link.

The DFS_INFO_5 structure has the following format.

```
typedef struct _DFS_INFO_5 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  GUID Guid;
```


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```
  unsigned long PropertyFlags;
  unsigned long MetadataSize;
  DWORD NumberOfStorages;
} DFS_INFO_5;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

Guid: The GUID of this root or link.

PropertyFlags: A bit field in which each bit is responsible for a specific property applicable to the entire DFS namespace, the DFS root, or an individual DFS link, depending on the actual property. Any combination of bits is allowed, unless indicated otherwise. The following are valid bit definitions for this field.

Value	Meaning
DFS_PROPERTY_FLAG_INSITE_REFERRALS 0x00000001	When set, indicates that **DFS in-site referral mode** is enabled.
DFS_PROPERTY_FLAG_ROOT_SCALABILITY 0x00000002	When set, indicates DFS root scalability mode is enabled. This flag is valid only for the DFS root of a domain-based DFS namespace.
DFS_PROPERTY_FLAG_SITE_COSTING 0x00000004	When set, indicates **DFS referral site costing** is enabled. This flag is valid only for a DFS root.
DFS_PROPERTY_FLAG_TARGET_FAILBACK 0x00000008	When set, indicates **DFS client target failback** is enabled.
DFS_PROPERTY_FLAG_CLUSTER_ENABLED 0x00000010	When set, indicates **clustered DFS namespace** is enabled.
DFS_PROPERTY_FLAG_ABDE 0x00000020	When set, enables **Access Based Directory Enumeration (ABDE) mode** on a domainv2-based DFS namespace or a stand-alone DFS namespace.<5>This flag is not supported on domainv1-based namespaces.

MetadataSize: The size, in bytes, of the DFS metadata of the DFS namespace. For a DFS link, this MUST be 0.

NumberOfStorages: The number of DFS targets for this root or link.

2.2.3.6 DFS_INFO_6

The DFS_INFO_6 structure contains information for a DFS root or a DFS link.

The DFS_INFO_6 structure has the following format.

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```
typedef struct _DFS_INFO_6 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  GUID Guid;
  unsigned long PropertyFlags;
  unsigned long MetadataSize;
  DWORD NumberOfStorages;
  [size_is(NumberOfStorages)] DFS_STORAGE_INFO_1* Storage;
} DFS_INFO_6;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

Guid: The GUID of this root or link.

PropertyFlags: Refers to the PropertyFlags field of DFS_INFO_5. For more information, see section 2.2.3.5.

MetadataSize: The size of the DFS metadata of the DFS namespace. This MUST be 0 for a DFS link.

NumberOfStorages: The number of DFS targets for this root or link. The protocol imposes no restrictions on the number of roots or links.

Storage: A pointer to an array of DFS_STORAGE_INFO_1 structures containing information about each target. The NumberOfStorages member specifies the number of structures within this storage array.

2.2.3.7 DFS_INFO_7

The DFS_INFO_7 structure contains information about a DFS root.

The DFS_INFO_7 structure has the following format.

```
typedef struct _DFS_INFO_7 {
  GUID GenerationGuid;
} DFS_INFO_7;
```

GenerationGuid: This GUID is modified each time DFS metadata is updated.

This data type is used to detect when the metadata of a DFS namespace has changed. It MUST be supported for domain-based DFS namespaces. It MAY be supported for stand-alone DFS namespaces; a null GUID (all 128-bits are 0) MUST be returned if this is not supported.<6>

2.2.3.8 DFS_INFO_8

The DFS_INFO_8 structure contains information for a DFS root or a DFS link.

The DFS_INFO_8 structure has the following format.

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```
typedef struct _DFS_INFO_8 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  GUID Guid;
  unsigned long PropertyFlags;
  unsigned long MetadataSize;
  ULONG SecurityDescriptorLength;
  [size_is(SecurityDescriptorLength)]
    PUCHAR pSecurityDescriptor;
  DWORD NumberOfStorages;
} DFS_INFO_8,
 *LPDFS_INFO_8;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

Guid: The GUID of this root or link.

PropertyFlags: Refers to the PropertyFlags field of DFS_INFO_5. For more information, see section 2.2.3.5.

MetadataSize: The size, in bytes, of the DFS metadata of the DFS namespace. For a DFS link, this MUST be 0.

SecurityDescriptorLength: The length, in bytes, of the buffer that the **pSecurityDescriptor** field points to.

pSecurityDescriptor: A self-relative security descriptor to be associated with a DFS link. For more information on security descriptors, see [MS-DTYP] section 2.4.6.

NumberOfStorages: The number of DFS targets for this root or link. The protocol imposes no restrictions on the number of roots or links.

2.2.3.9 DFS_INFO_9

The DFS_INFO_9 structure contains information for a DFS root or a DFS link.

The DFS_INFO_9 structure has the following format.

```
typedef struct _DFS_INFO_9 {
  [string] WCHAR* EntryPath;
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  GUID Guid;
  unsigned long PropertyFlags;
  unsigned long MetadataSize;
  ULONG SecurityDescriptorLength;
  [size_is(SecurityDescriptorLength)]
    PUCHAR pSecurityDescriptor;
  DWORD NumberOfStorages;
```


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```
  [size_is(NumberOfStorages)] LPDFS_STORAGE_INFO_1 Storage;
} DFS_INFO_9,
 *LPDFS_INFO_9;
```

EntryPath: A pointer to a DFS root or a DFS link path.

Comment: Pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. There are no protocol-specified restrictions on the length or content of this string. The comment is meant for human readability and has no effect on server functionality.

State: Refers to the State field of DFS_INFO_2. For more information, see section 2.2.3.2.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

Guid: The GUID of this root or link.

PropertyFlags: Refers to the PropertyFlags field of DFS_INFO_5. For more information, see section 2.2.3.5.

MetadataSize: The size, in bytes, of the DFS metadata of the DFS namespace. For a DFS link, this MUST be 0.

SecurityDescriptorLength: The length, in bytes, of the buffer that the **pSecurityDescriptor** field points to.

pSecurityDescriptor: A self-relative security descriptor to be associated with a DFS link. For more information on security descriptors, see [MS-DTYP] section 2.4.6.

NumberOfStorages: The number of DFS targets for this root or link. The protocol imposes no restrictions on the number of roots or links.

Storage: A pointer to an array of DFS_STORAGE_INFO_1 structures containing information about each target. The NumberOfStorages member specifies the number of structures within this storage array.

For information on target priority rank and class information, see section 2.2.2.6.

2.2.3.10 DFS_INFO_50

The DFS_INFO_50 structure is used to get the DFS metadata version and the capability information of an existing DFS namespace.

The DFS_INFO_50 structure has the following format.

```
typedef struct _DFS_INFO_50 {
  unsigned long NamespaceMajorVersion;
  unsigned long NamespaceMinorVersion;
  unsigned   int64 NamespaceCapabilities;
} DFS_INFO_50;
```

NamespaceMajorVersion: A value containing the major version number used to determine the DFS metadata format supported in a domain-based DFS namespace or a stand-alone DFS namespace.<7>

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NamespaceMinorVersion: A value containing the minor version number used to determine the DFS metadata format supported in a domain-based DFS namespace or stand-alone DFS namespace.<8>

NamespaceCapabilities: A value containing the capability information of a DFS namespace.

Value	Meaning
DFS__NAMESPACE_CAPABILITY_ABDE 0x0000000000000001	The specified DFS root supports using Access Based Directory Enumeration (ABDE) mode.<9>

2.2.4 Set Info Data Types

The structures in this section relate to the NetrDfsSetInfo and NetrDfsSetInfo2 methods when used to retrieve or set the configuration of the DFS server. The usage model of these structures is for the client to specify a *Level* parameter to indicate which DFS_INFO_STRUCT case to use.

2.2.4.1 DFS_INFO_101

The DFS_INFO_101 structure describes the storage state on a root, link, root target, or link target.

The DFS_INFO_101 structure has the following format.

```
typedef struct _DFS_INFO_101 {
  unsigned long State;
} DFS_INFO_101;
```

State: The state of the root, link, root target, or link target.

The following table lists the valid states that can be set for a root or a link. Some of these states are used to perform a server operation and are not persisted to the DFS metadata, as specified below. For more information about some of these states, see section 2.2.2.13.

Value	Meaning
DFS_VOLUME_STATE_OK 0x00000001	The specified DFS root or DFS link is in the normal state.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The specified DFS link is offline or unavailable. This flag is valid only for a DFS link. This state is persisted to the DFS metadata.
DFS_VOLUME_STATE_ONLINE 0x00000004	The specified DFS link is available. This flag is valid only for a DFS link. This state is persisted to the DFS metadata.
DFS_VOLUME_STATE_RESYNCHRONIZE 0x00000010	Forces a resynchronization on the DFS root. This flag is valid only for a DFS root. This operation is an incremental synchronization that picks up only changed objects in the metadata. This state is used to perform a server operation. It is not persisted to the DFS metadata.
DFS_VOLUME_STATE_STANDBY 0x00000020	Sets a root volume to standby mode. This flag is valid only for a clustered DFS root.

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Value	Meaning
	This state is used to perform a server operation. It is not persisted to the DFS metadata.
DFS_VOLUME_STATE_FORCE_SYNC 0x00000040	Forces a full resynchronization operation on the DFS root target of a specified domainv2-based DFS namespace or stand-alone DFS namespace to identify DFS links that have been added or deleted. This is not supported on a domainv1-based DFS namespace. DFS links MUST NOT be specified. This state is used to perform a server operation. It is not persisted to the DFS metadata.

DFS_VOLUME_STATES (0x0000000F) is not relevant here, because it is a mask used when reading the volume state, not for setting it.

The following table lists the valid states that can be set for a root target or a link target.

Value	Meaning
DFS_STORAGE_STATE_OFFLINE 0x00000001	This target is offline and unavailable for use.
DFS_STORAGE_STATE_ONLINE 0x00000002	This target is online and available for use.

2.2.4.2 DFS_INFO_102

The DFS_INFO_102 structure contains a time-out value for a DFS root or a DFS link.

The DFS_INFO_102 structure has the following format.

```
typedef struct _DFS_INFO_102 {
  unsigned long Timeout;
} DFS_INFO_102;
```

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

2.2.4.3 DFS_INFO_103

The DFS_INFO_103 structure contains properties that set specific behaviors for a DFS root or a DFS link.

The DFS_INFO_103 structure has the following format.

```
typedef struct _DFS_INFO_103 {
  unsigned long PropertyFlagMask;
  unsigned long PropertyFlags;
} DFS_INFO_103;
```

PropertyFlagMask: Indicates which bits in the **PropertyFlags** field are considered for modification of DFS namespace root or link properties.

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Value	Meaning
DFS_PROPERTY_FLAG_INSITE_REFERRALS 0x00000001	Valid for domain and stand-alone DFS roots and links.
DFS_PROPERTY_FLAG_ROOT_SCALABILITY 0x00000002	This flag is valid only for the DFS root of a domain-based DFS namespace.
DFS_PROPERTY_FLAG_SITE_COSTING 0x00000004	This flag is valid only for a DFS root.
DFS_PROPERTY_FLAG_TARGET_FAILBACK 0x00000008	Valid for domain and stand-alone DFS roots and links.
DFS_PROPERTY_FLAG_ABDE 0x00000020	Valid only for a domainv2-based DFS namespace or stand-alone DFS namespace root.<10> This flag is not supported on domainv1-based namespaces.

PropertyFlags: A bit field in which each bit is responsible for a specific property applicable to the whole DFS namespace, the DFS root, or an individual DFS link, depending on the actual property. Any combination of bits is allowed, unless indicated otherwise. The server considers the bits in this field only when the corresponding bit in the **PropertyFlagMask** field is set. The following table lists the valid bits for this field and describes the actions taken when each bit is set or not set in the request.

Value	Meaning
DFS_PROPERTY_FLAG_INSITE_REFERRALS 0x00000001	When set, enables DFS in-site referral mode. When not set, disables DFS in-site referral mode.
DFS_PROPERTY_FLAG_ROOT_SCALABILITY 0x00000002	When set, enables DFS root scalability mode. When not set, disables DFS root scalability mode.
DFS_PROPERTY_FLAG_SITE_COSTING 0x00000004	When set, enables DFS referral site costing. When not set, disables DFS referral site costing.
DFS_PROPERTY_FLAG_TARGET_FAILBACK 0x00000008	When set, enables DFS client target failback. When not set, disables DFS client target failback.
DFS_PROPERTY_FLAG_ABDE 0x00000020	When set, enables ABDE mode on a domainv2-based DFS namespace or stand-alone DFS namespace. When not set, disables ABDE mode on a domainv2-based DFS namespace or stand-alone DFS namespace.

2.2.4.4 DFS_INFO_104

The DFS_INFO_104 structure contains the priority of a DFS root target or a DFS link target.

The DFS_INFO_104 structure has the following format.

```
typedef struct _DFS_INFO_104 {
  DFS_TARGET_PRIORITY TargetPriority;
} DFS_INFO_104;
```


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TargetPriority: A DFS_TARGET_PRIORITY structure that indicates the priority rank and priority class of a target. For more information on prioritization, see section 2.2.2.7.

2.2.4.5 DFS_INFO_105

The DFS_INFO_105 structure contains information about a DFS root or DFS link, including comment, state, time-out, and DFS behaviors specified by property flags.

The DFS_INFO_105 structure has the following format.

```
typedef struct  DFS INFO 105 {
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  unsigned long PropertyFlagMask;
  unsigned long PropertyFlags;
} DFS_INFO_105;
```

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality.

State: The following table lists the valid states that can be set for links. All other values are reserved and MUST NOT be used. For more information about some of these states, see section 2.2.2.13.

Value	Meaning
0x00000000	Indicates that the existing state MUST NOT be changed.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The specified DFS link is offline or unavailable. This flag is valid only for a DFS link.
DFS_VOLUME_STATE_ONLINE 0x00000004	The specified DFS link is available. This flag is valid only for a DFS link.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

PropertyFlagMask: Indicates which bits in the **PropertyFlags** field are valid.

PropertyFlags: Refers to the **PropertyFlags** field of DFS_INFO_103, as specified in section 2.2.4.3.

2.2.4.6 DFS_INFO_106

The DFS_INFO_106 structure contains the storage state and priority of a DFS root target or a DFS link target. For more information on prioritization, see section 2.2.2.7.

The DFS_INFO_106 structure has the following format.

```
typedef struct  DFS INFO 106 {
  DWORD State;
  DFS_TARGET_PRIORITY TargetPriority;
} DFS_INFO_106;
```

State: The state of the target. Contains one of the following valid state values.

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Value	Meaning
DFS_STORAGE_STATE_OFFLINE 0x00000001	This target is offline and unavailable for use.
DFS_STORAGE_STATE_ONLINE 0x00000002	This target is online and available for use.

TargetPriority: A DFS_TARGET_PRIORITY structure that indicates the priority class and rank of the DFS target.

2.2.4.7 DFS_INFO_107

The DFS_INFO_107 structure contains information about a DFS root or DFS link, including comment, state, time-out, security descriptor, and DFS behaviors specified by property flags.

The DFS_INFO_107 structure has the following format.

```
typedef struct _DFS_INFO_107 {
  [string] WCHAR* Comment;
  DWORD State;
  unsigned long Timeout;
  unsigned long PropertyFlagMask;
  unsigned long PropertyFlags;
  ULONG SecurityDescriptorLength;
  [size_is(SecurityDescriptorLength)]
    PUCHAR pSecurityDescriptor;
} DFS_INFO_107;
```

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human readability and does not affect server functionality.

State: The states that can be set for links. The following table lists such states. All other values are reserved and MUST NOT be used. For more information about some of these states, see section 2.2.2.13.

Value	Meaning
0x00000000	Indicates that the existing state MUST NOT be changed.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The specified DFS link is offline or unavailable. This flag is valid only for a DFS link.
DFS_VOLUME_STATE_ONLINE 0x00000004	The specified DFS link is available. This flag is valid only for a DFS link.

Timeout: The time-out, in seconds, associated with the root or link and used in a DFS referral response to a DFS client.

PropertyFlagMask: Indicates which bits in the **PropertyFlags** field are valid.

PropertyFlags: Refers to the **PropertyFlags** field of DFS_INFO_103, as specified in section 2.2.4.3.

SecurityDescriptorLength: The length, in bytes, of the buffer that the **pSecurityDescriptor** field points to.

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pSecurityDescriptor: A self-relative security descriptor to be associated with a DFS link. For more information on security descriptors, see [MS-DTYP] section 2.4.6.

2.2.5 Special Info Data Types

The structures in this section relate to the NetrDfsEnum, NetrDfsEnumEx, NetrDfsGetInfo, NetrDfsSetInfo, and NetrDfsSetInfo2 methods when used to retrieve or set the DFS server configuration. The usage model of these structures is for the client to specify a *Level* parameter to indicate which case of the DFS_INFO_STRUCT to use.

2.2.5.1 DFS_INFO_100

The DFS_INFO_100 structure relates to the NetrDfsGetInfo, NetrDfsSetInfo, and NetrDfsSetInfo2 methods when used to retrieve or set comment text about a DFS root or a DFS link. The structure contains a comment associated with a DFS root or a DFS link.

The DFS_INFO_100 structure has the following format.

```
typedef struct  DFS_INFO_100 {
  [string] WCHAR* Comment;
} DFS_INFO_100;
```

Comment: A pointer to a null-terminated Unicode string containing a comment associated with the DFS root or DFS link that is for informational purposes. This string has no protocol-specified restrictions on length or content. The comment is meant for human readability and does not affect server functionality.

2.2.5.2 DFS_INFO_150

The DFS_INFO_150 structure relates to the NetrDfsGetInfo, NetrDfsSetInfo, and NetrDfsSetInfo2 methods when used to retrieve or set security descriptors associated with a DFS link. The structure contains the self-relative security descriptor associated with a DFS link.

The DFS_INFO_150 structure has the following format.

```
typedef struct _DFS_INFO_150 {
  ULONG SecurityDescriptorLength;
  [size_is(SecurityDescriptorLength)]
    PUCHAR pSecurityDescriptor;
} DFS_INFO_150;
```

SecurityDescriptorLength: The length, in bytes, of the buffer that the **pSecurityDescriptor** field points to.

pSecurityDescriptor: A self-relative security descriptor associated with DFS. For more information on security descriptors, see [MS-DTYP] section 2.4.6.

2.2.5.3 DFS_INFO_200

The DFS_INFO_200 structure relates to the NetrDfsEnumEx method when used to enumerate all of the domain-based DFS namespace in a domain. The structure contains the name of a domain-based DFS namespace. The DFS_INFO_200 structure has the following format.

```
typedef struct _DFS_INFO_200 {
  [string] WCHAR* FtDfsName;
```


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```
} DFS_INFO_200;
```

FtDfsName: A pointer to a DFS root path.

2.2.5.4 DFS_INFO_300

The DFS_INFO_300 structure relates to the NetrDfsEnum and NetrDfsEnumEx methods when used to enumerate DFS roots hosted on a server. The structure contains the name and type (domain-based or stand-alone) of a DFS namespace. The DFS_INFO_300 structure has the following format.

```
typedef struct _DFS_INFO_300 {
  DWORD Flags;
  [string] WCHAR* DfsName;
} DFS_INFO_300;
```

Flags: This value specifies the type of the DFS namespace. This MUST have one of the following two permitted values.

Value	Meaning
DFS_VOLUME_FLAVOR_STANDALONE 0x00000100	Stand-alone DFS namespace.
DFS_VOLUME_FLAVOR_AD_BLOB 0x00000200	Domain-based DFS namespace.

DfsName: A pointer to a DFS root path.

2.2.6 Enum Info Data Types

The structures in this section relate to the NetrDfsEnum and NetrDfsEnumEx methods when used to enumerate and retrieve the configuration of the DFS server. The usage model of these structures is for the client to specify a *Level* parameter to indicate which case of the DFS_INFO_ENUM_STRUCT to use.

2.2.6.1 DFS_INFO_1_CONTAINER

The DFS_INFO_1_CONTAINER structure contains an array of DFS_INFO_1 structures. The DFS_INFO_1_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_1_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_1* Buffer;
} DFS_INFO_1_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_1 structures.

2.2.6.2 DFS_INFO_2_CONTAINER

The DFS_INFO_2_CONTAINER structure contains an array of DFS_INFO_2 structures. The DFS_INFO_2_CONTAINER structure has the following format.

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```
typedef struct _DFS_INFO_2_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_2* Buffer;
} DFS_INFO_2_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_2 structures.

2.2.6.3 DFS_INFO_3_CONTAINER

The DFS_INFO_3_CONTAINER structure contains an array of DFS_INFO_3 structures. The DFS_INFO_3_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_3_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_3* Buffer;
} DFS_INFO_3_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_3 structures.

2.2.6.4 DFS_INFO_4_CONTAINER

The DFS_INFO_4_CONTAINER structure contains an array of DFS_INFO_4 structures. The DFS_INFO_4_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_4_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_4* Buffer;
} DFS_INFO_4_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_4 structures.

2.2.6.5 DFS_INFO_5_CONTAINER

The DFS_INFO_5_CONTAINER structure contains an array of DFS_INFO_5 structures. The DFS_INFO_5_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_5_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_5* Buffer;
} DFS_INFO_5_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_5 structures.

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2.2.6.6 DFS_INFO_6_CONTAINER

The DFS_INFO_6_CONTAINER structure contains an array of DFS_INFO_6 structures. The DFS_INFO_6_CONTAINER structure has the following format.

```
typedef struct  DFS_INFO_6_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_6* Buffer;
} DFS_INFO_6_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_6 structures.

2.2.6.7 DFS_INFO_8_CONTAINER

The DFS_INFO_8_CONTAINER structure contains an array of DFS_INFO_8 structures. The DFS_INFO_8_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_8_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] LPDFS_INFO_8 Buffer;
} DFS_INFO_8_CONTAINER,
 *LPDFS_INFO_8_CONTAINER;
```

EntriesRead: The number of DFS_INFO_8 elements in the array.

Buffer: The array of DFS_INFO_8 structures.

2.2.6.8 DFS_INFO_9_CONTAINER

The DFS_INFO_9_CONTAINER structure contains an array of DFS_INFO_9 structures. The DFS_INFO_9_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_9_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] LPDFS_INFO_9 Buffer;
} DFS_INFO_9_CONTAINER,
 *LPDFS_INFO_9_CONTAINER;
```

EntriesRead: The number of DFS_INFO_9 elements in the array.

Buffer: The array of DFS_INFO_9 structures.

2.2.6.9 DFS_INFO_200_CONTAINER

The DFS_INFO_200_CONTAINER structure contains an array of DFS_INFO_200 structures. The DFS_INFO_200_CONTAINER structure has the following format.

```
typedef struct  DFS_INFO_200_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_200* Buffer;
} DFS_INFO_200_CONTAINER;
```

EntriesRead: The number of elements in the array.

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Buffer: The array of DFS_INFO_200 structures.

2.2.6.10 DFS_INFO_300_CONTAINER

The DFS_INFO_300_CONTAINER structure contains an array of DFS_INFO_300 structures. The DFS_INFO_300_CONTAINER structure has the following format.

```
typedef struct _DFS_INFO_300_CONTAINER {
  DWORD EntriesRead;
  [size_is(EntriesRead)] DFS_INFO_300* Buffer;
} DFS_INFO_300_CONTAINER;
```

EntriesRead: The number of elements in the array.

Buffer: The array of DFS_INFO_300 structures.

2.3 Directory Service Schema Elements

The protocol accesses the following **Directory Service (DS)** schema classes and attributes listed in the following table.

For the syntactic specifications of the following <Class> or <Class><Attribute> pairs, or rootDSE attributes, refer either to **Active Directory Domain Services (AD DS)** ([MS-ADA2], [MS-ADA3], and [MS-ADSC]) or to Active Directory Technical Specification ([MS-ADTS]).

Class	Attribute
attributeSchema	rangeUpper
dfsConfiguration	All
ftDFS	objectClass pKT pKTGuid remoteServerName
msDFS-DeletedLinkv2	All objectClass
msDFS-Linkv2	All objectClass
msDFS-NamespaceAnchor	All
msDFS-Namespacev2	All objectClass
rootDSE	domainFunctionality

This section contains specifications for the DFS configuration container, DFS namespace object, and pKT attribute.

2.3.1 DFS Configuration Container

The DFS configuration container is a well-known container in the domain directory that is used to hold the DFS metadata for a domain-based DFS namespace. The container has the following **distinguished name (DN)**.

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```
CN=Dfs-Configuration,CN=System,<domain>
```

where <domain> is the DN of the domain.

For example, the DFS configuration container for the contoso.com domain would be named as follows.

```
CN=Dfs-Configuration,CN=System,DC=contoso,DC=com
```

The object class of this object is dfsConfiguration, and its schema is as specified in [MS-ADSC].

2.3.2 LDAP Entries for Domain-Based DFS Namespaces

LDAP entries exist in both domainv1-based DFS namespace and domainv2-based DFS namespace. This relationship is shown in the following figure.

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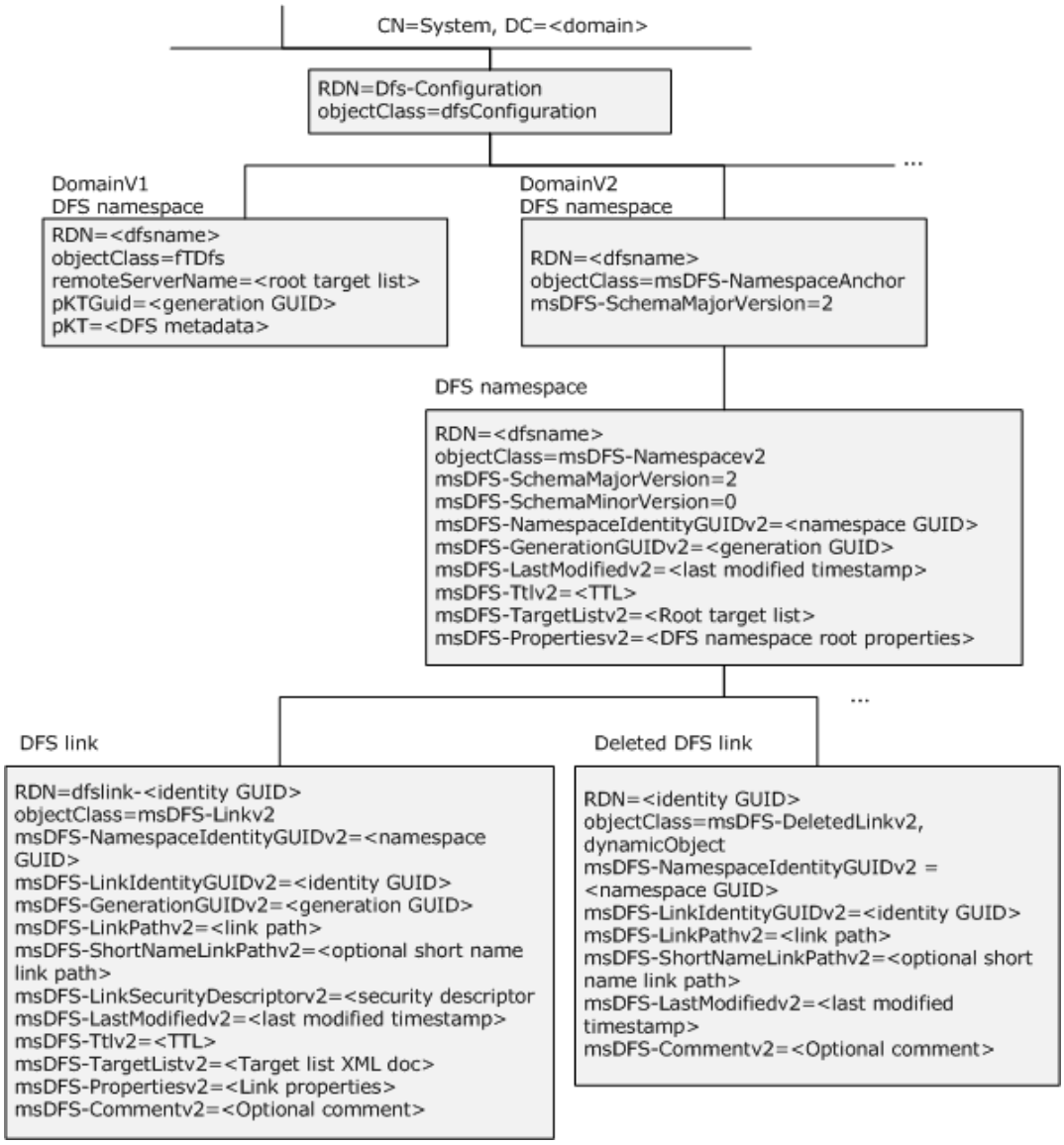

Figure 1: Organization of DFS-related LDAP entries in DFS namespaces

Each domainv1-based DFS namespace has its DFS metadata stored in the directory service as a BLOB in the **pKT** attribute of an LDAP entry.

Each domainv2-based DFS namespace has one DFS namespace anchor LDAP entry, one DFS namespace LDAP entry below it, and one LDAP entry per DFS link in the namespace under the DFS namespace LDAP entry.

Like the **relative distinguished name (RDN)** of a domainv1-based DFS namespace, the relative distinguished name (RDN) of a domainv2-based DFS namespace entry is based on the DFS namespace. Thus, there is no issue of a name collision with a domainv1-based DFS namespace and a domainv2-based DFS namespace having the same name. The directory service will fail an attempt to create such a scenario.

The following sections specify both domain-based DFS namespace formats.

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2.3.3 DFS Namespace Object for Domainv1-Based DFS Namespace

An object exists for each domainv1-based DFS namespace in the DFS configuration container. The following is a DN of the object of a domain-based DFS namespace.

```
CN=<DFSNamespaceName>,CN=Dfs-Configuration,CN=System,<domain>
```

where:

- <DFSNamespaceName> is the domain-based DFS namespace.
- <domain> is the DN of the domain.

The following attributes apply to this object.

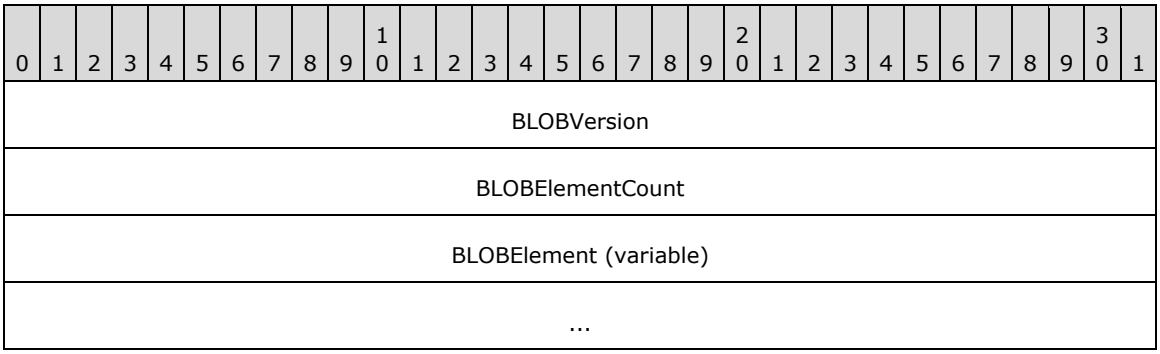
Attribute	Description
name	The DFS namespace name.
remoteServerName	A multivalued attribute that contains the DFS root targets for the DFS namespace with the value "*" as the last attribute.
pKTGuid	A GUID used as a generation number to detect changes to the DFS metadata. This MUST be updated whenever the **pKT** attribute is changed.
pKT	The BLOB containing the DFS metadata.

The objectClass of this object is fTDfs, and its schema is specified in [MS-ADSC]. The schema of the attributes name, remoteServerName, pKTGuid, and pKT are specified in [MS-ADA3].

2.3.3.1 pKT Attribute Contents (Metadata for Domainv1-Based Namespace)

The **pKT** attribute contains the DFS metadata of the domain-based DFS namespace that the object represents.

The DFS metadata has the following format.



BLOBVersion (4 bytes): The DFS metadata format version stored as an unsigned, 32-bit, **little-endian** integer. This MUST always be set to 0.

BLOBElementCount (4 bytes): The number of <BLOBElement> elements that immediately follow this field in the DFS metadata stored as an unsigned, 32-bit, little-endian integer.

BLOBElement (variable): A variable number of DFSNamespaceElementBLOB structures, which immediately follow the BLOBElementCount. Each DFSNamespaceElementBLOB contains descriptive

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information about a DFS site, root, or link. The format and size of each DFSNamespaceElementBLOB depend on the information contained in it.

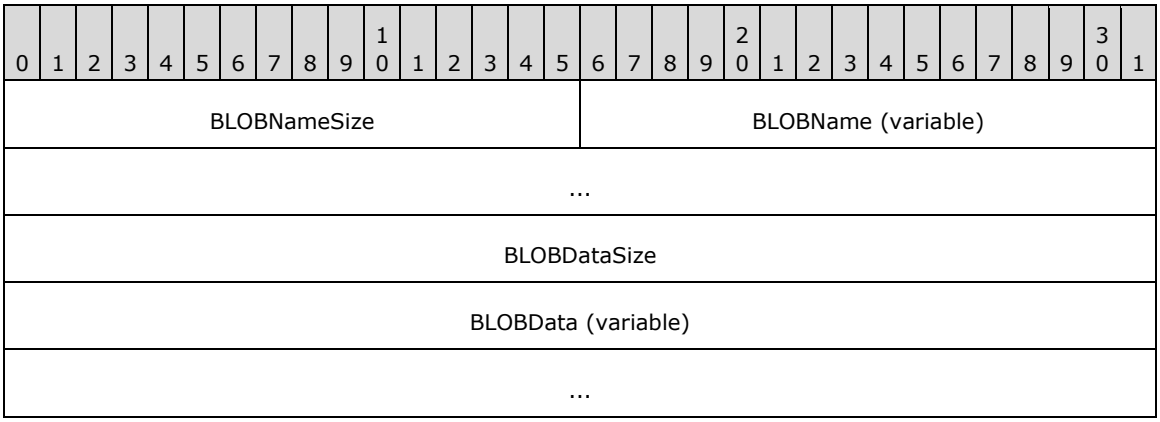
2.3.3.1.1 DFSNamespaceElementBLOB

A DFSNamespaceElementBLOB contains information about a DFS root or a DFS link, or for mapping a server to its site name.

The DFS metadata of a valid DFS namespace MUST consist of one DFSNamespaceRootBLOB for the DFS root and one DFSNamespaceLinkBLOB for each DFS link in the DFS namespace. There MUST no more than one SiteInformationBLOB. For more information on SiteInformationBLOB, see section 2.3.3.1.1.4.

No alignment padding requirements exist for any of a BLOB's fields, unless otherwise specified.

Each DFSNamespaceElementBLOB contains the following data elements. The first three fields are standard for all DFSNamespaceElementBLOB structures. Following those fields are additional fields that are specific to the type of DFSNamespaceElementBLOB, in the format of a DFSNamespaceRootBLOB, a DFSNamespaceLinkBLOB, or a SiteInformationBLOB.



BLOBNameSize (2 bytes): The size of the **BLOBName**, in bytes, stored as an unsigned, 16-bit, little-endian integer.

BLOBName (variable): The name of the DFSNamespaceElementBLOB, stored as a string of Unicode characters.

Value	Meaning
SiteInformationBLOB "\siteroot"	A string of Unicode characters that forms the literal "\siteroot".<11>
DFSNamespaceRootBLOB "\domainroot"	A string of Unicode characters that forms the literal "\domainroot".
DFSNamespaceLinkBLOB "\domainroot\<GUIDString>"	A string of Unicode characters that forms the literal "\domainroot\<GUIDString>", where <GUIDString> represents the string form of a GUID, as specified in [RFC4122], section 3. The GUID found in the link's ID BLOB MUST be used to create this.

BLOBDataSize (4 bytes): The length of the BLOB in the **BLOBData** field, stored as an unsigned, 32-bit, little-endian integer. The value of this field MUST be used to determine the start of the next DFSNamespaceElementBLOB.

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BLOBData (variable): Data specific to the type of BLOB described, in the form of a DFSNamespaceRootBLOB, DFSNamespaceLinkBLOB, or SiteInformationBLOB.

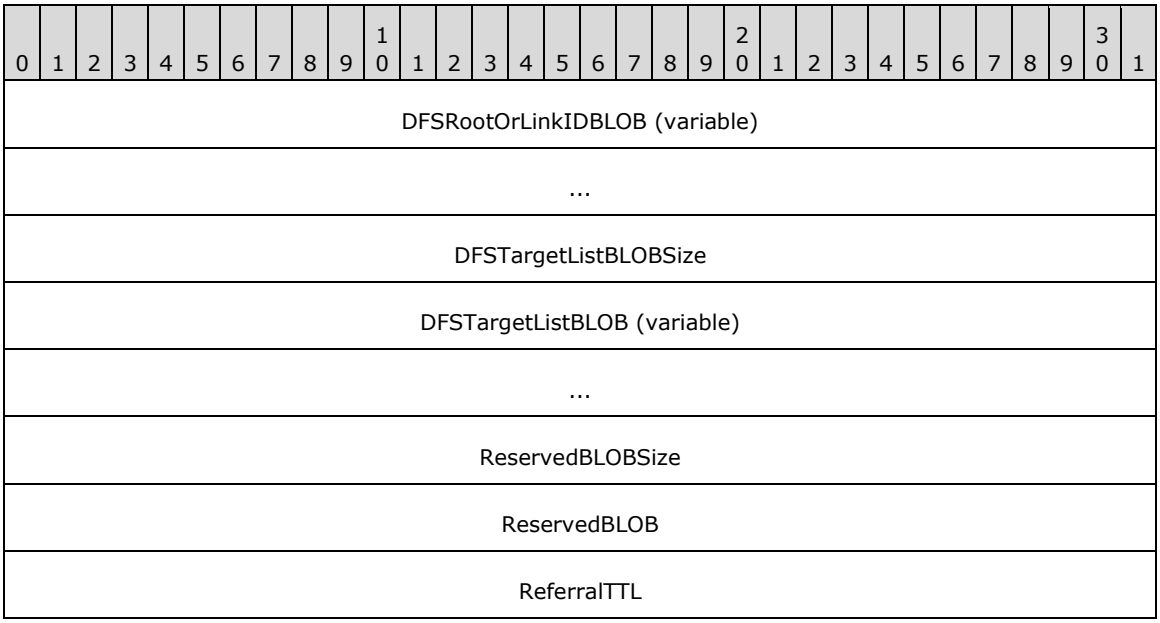
The following sections specify the format of the DFSNamespaceRootBLOB, DFSNamespaceLinkBLOB, and SiteInformationBLOB.

2.3.3.1.1.1 DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB

At most, only one DFSNamespaceRootBLOB can contain information about the DFS namespace root. One DFSNamespaceLinkBLOB exists for each DFS link in the namespace.

Each DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB MUST have the following:

- One BLOB containing the name and other information about the DFS namespace root or DFS link. This is the DFSRootOrLinkIDBLOB, as specified in section 2.3.3.1.1.2.
- One BLOB containing the DFS targets of the DFS root or DFS link. This is the DFSTargetListBLOB, as specified in section 2.3.3.1.1.3.
- One reserved BLOB.



DFSRootOrLinkIDBLOB (variable): A BLOB that contains identification and status information for this DFS root or DFS link.

DFSTargetListBLOBSize (4 bytes): The size, in bytes, of the BLOB in the **TargetListBLOB** field that immediately follows this field. The DFSTargetListBLOBSize is stored as an unsigned, 32-bit, little-endian integer.

DFSTargetListBLOB (variable): A BLOB that contains the list of targets for the DFS root or DFS link.

ReservedBLOBSize (4 bytes): The size, in bytes, of the BLOB in the **ReservedBLOB** field that immediately follows this field. The **ReservedBLOBSize** is stored as an unsigned, 32-bit, little-endian integer and MUST be 4.

ReservedBLOB (4 bytes): When creating a new DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB, this **ReservedBLOB** MUST be zero-filled. When updating an existing DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB, the contents of this **ReservedBLOB** MUST be preserved.

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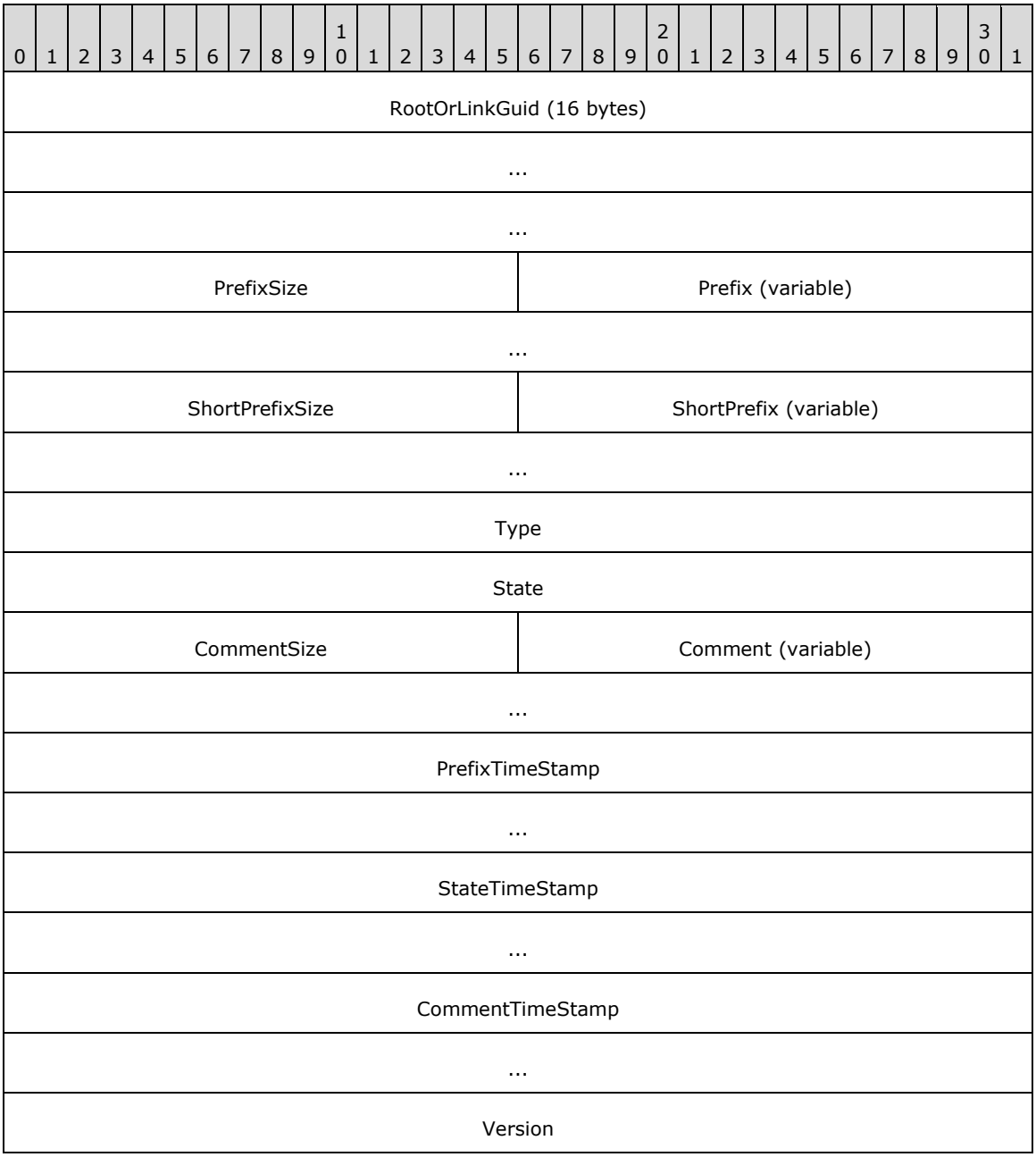
ReferralTTL (4 bytes): The referral time-out value, in seconds, for the DFS root or DFS link. The **ReferralTTL** is stored as an unsigned, 32-bit, little-endian integer.

2.3.3.1.1.2 DFSRootOrLinkIDBLOB

This BLOB contains name and other information about the DFS namespace root or the DFS link.

- If the PKT_ENTRY_TYPE_REFERRAL_SVC (0x00000080) bit is set in the **Type** field, then this BLOB describes the DFS root and is, hence, part of the DFSNamespaceRootBLOB.
- If the PKT_ENTRY_TYPE_REFERRAL_SVC (0x00000080) bit is not set in the **Type** field, then this BLOB describes a link and is, hence, part of the DFSNamespaceLinkBLOB.



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RootOrLinkGuid (16 bytes): A GUID that identifies the DFS root or the DFS link. It is used to generate the name "\<domainroot>\<GUIDString>" in the **BLOBName** field of the DFSNamespaceLinkBLOB, where <GUIDString> represents the string form of the GUID, as specified in [RFC4122], section 3.

PrefixSize (2 bytes): The size, in bytes, of the **Prefix** field, stored as an unsigned, 16-bit, little-endian integer.

Prefix (variable): The name of the DFS namespace root or the DFS link. The **Prefix** is stored as a string of Unicode characters and MUST be a UNC path string with one leading backslash, instead of the usual two, without a null termination.

ShortPrefixSize (2 bytes): The size, in bytes, of the **ShortPrefix** field, stored as an unsigned, 16-bit, little-endian integer.

ShortPrefix (variable): The name of the DFS namespace root or the DFS link, stored as a string of Unicode characters. This MUST be a UNC path string with one leading backslash, instead of the usual two, without a null termination. The string MAY be the same as that in the **Prefix** field or its **8.3 name**.<12>

Type (4 bytes): A bit field, stored as 32-bits in little-endian order, which describes this BLOB.

For domainv1 roots, the **Type** field parallels the functionality of the **msDFS-Propertiesv2** attribute used for domainv2-based DFS namespaces (see section 2.3.4.2) and domainv2-based DFS links (see section 2.3.4.3).

Value	Meaning
PKT_ENTRY_TYPE_DFS 0x00000001	This value is reserved and the **Type** field MUST always be set with this value.
PKT_ENTRY_TYPE_OUTSIDE_MY_DOM 0x00000010	The **DFS interlink** property. This MUST be set only when at least one DFS link target points to another DFS namespace. This MUST NOT be set for a DFS root.
PKT_ENTRY_TYPE_INSITE_ONLY 0x00000020	The DFS in-site referral mode property. When set, instructs the DFS server to enable the DFS in-site referral mode.
PKT_ENTRY_TYPE_COST_BASED_SITE_SELECTION 0x00000040	The DFS referral site costing property. Enables DFS referral site costing. This SHOULD be supported.<13>
PKT_ENTRY_TYPE_REFERRAL_SVC 0x00000080	This identifies the DFS namespace root.
PKT_ENTRY_TYPE_ROOT_SCALABILITY 0x00000200	The DFS root scalability mode property. This enables DFS root scalability mode. This SHOULD be supported.<14>
PKT_ENTRY_TYPE_TARGET_FAILBACK 0x00008000	The DFS client target failback property. This enables DFS client target failback for targets of this root or link. This SHOULD be supported.<15>

Undefined bit positions MUST be set to 0 on writes and ignored on reads.

State (4 bytes): The status of the DFS root or DFS link stored as an unsigned, 32-bit, little-endian integer. The DFS_VOLUME_STATES bitmask (0x0000000F) MUST be used to access the following DFS root or DFS link state from this field. For more information about some of these states, see section 2.2.2.13.

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Value	Meaning
DFS_VOLUME_STATE_OK 0x00000001	The DFS root or DFS link state is okay.
RESERVED 0x00000002	This value is reserved and MUST NOT be used.
DFS_VOLUME_STATE_OFFLINE 0x00000003	The DFS link is offline and not available for use.
DFS_VOLUME_STATE_ONLINE 0x00000004	The DFS link is online and available for use.

Undefined bit positions of this field MUST be set to 0 on writes and ignored on reads.

CommentSize (2 bytes): The size, in bytes, of the **Comment** field and stored as an unsigned, 16-bit, little-endian integer.

Comment (variable): A string of Unicode characters whose size in bytes is specified by the **CommentSize** field. The **Comment** field is associated with the namespace root or link and is for informational purposes. The comment is meant for human consumption and does not affect server functionality.

PrefixTimeStamp (8 bytes): The time of the last **Prefix** field modification, stored as FILETIME, as specified in [MS-DTYP] section 2.3.3. This SHOULD be set to the last modification time of this BLOB.

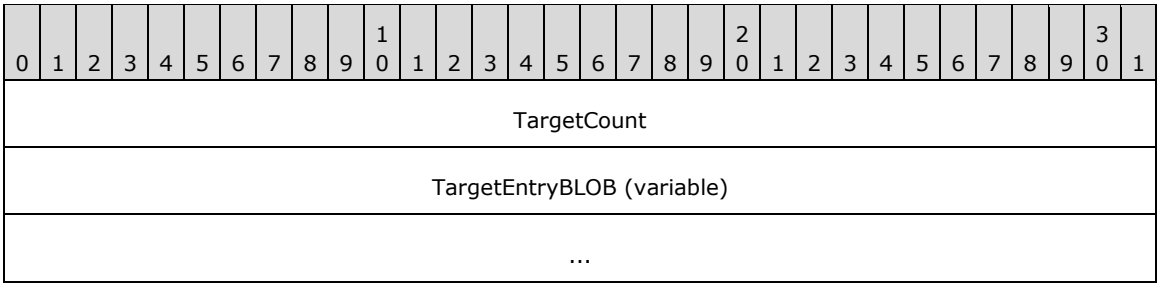
StateTimeStamp (8 bytes): The time of the last **State** field modification, stored as FILETIME, as specified in [MS-DTYP] section 2.3.3. This SHOULD be set to the last modification time of this BLOB.

CommentTimeStamp (8 bytes): The time of the last **Comment** field modification, stored as FILETIME, as specified in [MS-DTYP] section 2.3.3. This SHOULD be set to the last modification time of this BLOB.

Version (4 bytes): The version number of DFSRootOrLinkIDBLOB, stored as an unsigned, 32-bit, little-endian integer. When creating a new DFSRootOrLinkIDBLOB, this MUST be set to 0x00000003. When updating an existing DFSRootOrLinkIDBLOB, the existing value MUST be preserved.

2.3.3.1.1.3 DFSTargetListBLOB

The DFSTargetListBLOB contains information about all of the targets of the DFS root or DFS link.



TargetCount (4 bytes): The number of TargetEntryBLOB fields contained in this BLOB, stored as an unsigned, 32-bit, little-endian integer.

TargetEntryBLOB (variable): A BLOB that contains metadata for a DFS target.

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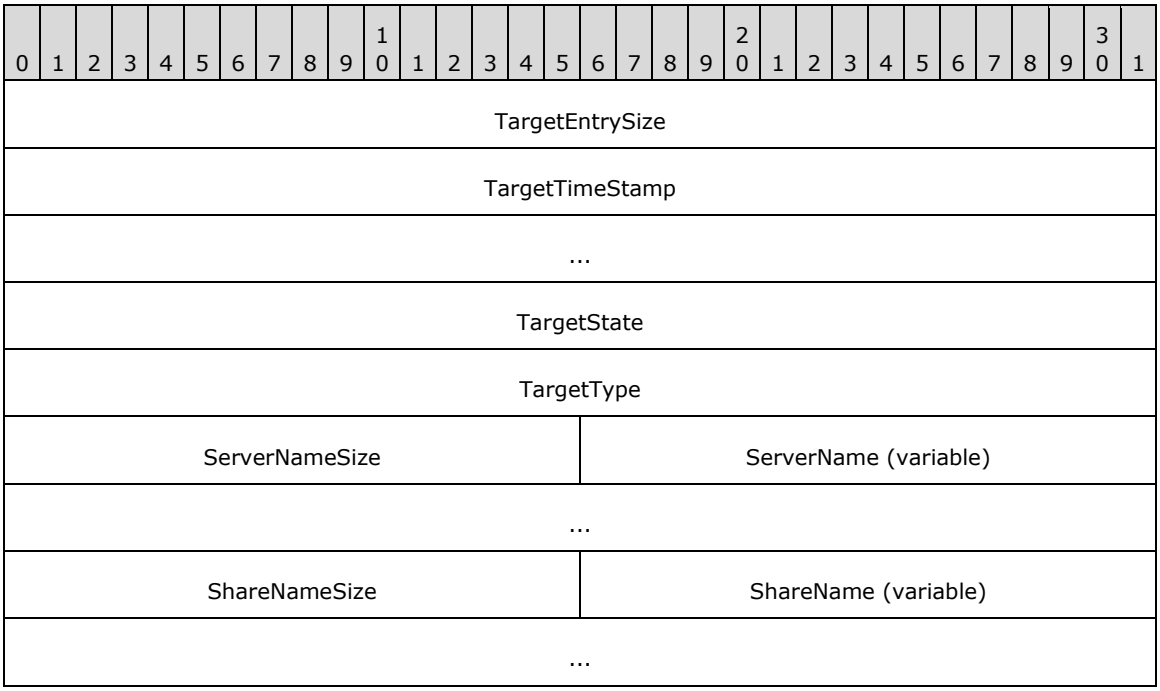
2.3.3.1.1.3.1 TargetEntryBLOB

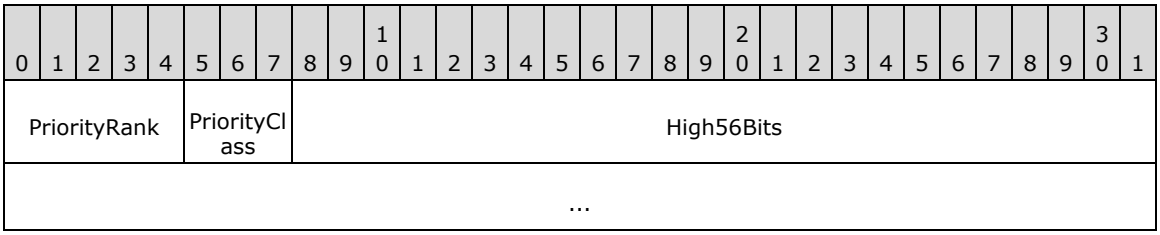
The TargetEntryBLOB holds metadata for the DFS target of a root or a link.



TargetEntrySize (4 bytes): The size, in bytes, of this target entry, starting from the **TargetTimeStamp** field, and stored as an unsigned, 32-bit, little-endian integer.

TargetTimeStamp (8 bytes): If bits 9 through 63 contain nonzero values, this field encodes the last modification time of this target entry, stored as FILETIME, as specified in [MS-DTYP] section 2.3.3. In this case the **PriorityRank** and **PriorityClass** members, discussed below, are considered to logically contain zero if referenced by an implementation.

If bits 9 through 63 are zero, the 64 bits of the **TargetTimeStamp** has the following format:



PriorityRank (5 bits): The priority rank of a target, ranging in value from 0x00 to 0x1F, where 0x00 is the highest rank.

PriorityClass (3 bits): The priority class of a target. One of the following values.

Value	Meaning
DFS_TARGET_PRIORITY_CLASS_SITE_COST_NORMAL 0x0	See DfsSiteCostNormalPriorityClass in section 2.2.2.8.
DFS_TARGET_PRIORITY_CLASS_GLOBAL_HIGH	See DfsSGlobalHighPriorityClass in section 2.2.2.8.

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Value	Meaning
0x1	
DFS_TARGET_PRIORITY_CLASS_SITE_COST_HIGH 0x2	See DfsSiteCostHighPriorityClass in section 2.2.2.8
DFS_TARGET_PRIORITY_CLASS_SITE_COST_LOW 0x3	See DfsSiteCostLowPriorityClass in section 2.2.2.8
DFS_TARGET_PRIORITY_CLASS_GLOBAL_LOW 0x4	see DfsGlobalLowPriorityClass in section 2.2.2.8

High56Bits (7 bytes): Set to zero.

TargetState (4 bytes): The state of this target, stored as an unsigned, 32-bit, little-endian integer. The mask 0x0000000F is used to extract a bit field that contains one of the following valid state values.

Value	Meaning
DFS_STORAGE_STATE_OFFLINE 0x00000001	This target is offline and unavailable for use.
DFS_STORAGE_STATE_ONLINE 0x00000002	This target is online and available for use.
DFS_STORAGE_STATE_ACTIVE 0x00000004	This target is active.

TargetType (4 bytes): The type of target, stored as an unsigned, 32-bit, little-endian integer bit field. This SHOULD be set to 0x00000002.<16>

ServerNameSize (2 bytes): The size, in bytes, of the **ServerName** field, stored as an unsigned 16-bit, little-endian integer.

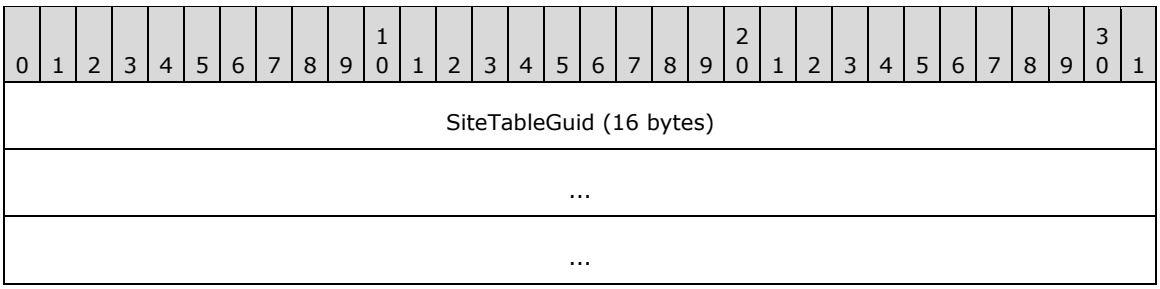
ServerName (variable): An array of Unicode characters that contains the DFS target server host name. The size of the array is given in the ServerNameSize field.

ShareNameSize (2 bytes): The size, in bytes, of the ShareName, stored as an unsigned, 16-bit, little-endian integer.

ShareName (variable): An array of Unicode characters that contains the DFS target share name.

2.3.3.1.1.4 SiteInformationBLOB

The SiteInformationBLOB contains the mapping from a DFS target host name to its site name. There MUST be no more than one BLOB of this type. This BLOB contains zero or more SiteEntryBLOBs.



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SiteEntryCount
SiteEntryBLOB (variable)
...

SiteTableGuid (16 bytes): The GUID that uniquely identifies the SiteInformationBLOB.

SiteEntryCount (4 bytes): The number of SiteEntryBLOBs in the SiteEntryBLOB field, stored as an unsigned, 32-bit, little-endian integer. This MAY be zero.<17><18>

SiteEntryBLOB (variable): Zero or more BLOBs. Each BLOB contains the site of a root target or link target server in the DFS namespace.

2.3.3.1.1.4.1 SiteEntryBLOB

This BLOB contains a host name whose site information is specified by the SiteNameInfoBLOB (for more information, see section 2.3.3.1.1.4.1.1).

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
ServerNameSize																ServerName (variable)															
...																															
SiteNameInfoCount																															
SiteNameInfoBLOB (variable)																															
...																															

ServerNameSize (2 bytes): The size, in bytes, of the **ServerName** field, stored as an unsigned, 16-bit, little-endian integer.

ServerName (variable): A string of Unicode characters representing the DFS target host name.

SiteNameInfoCount (4 bytes): The number of SiteNameInfoBLOBs in the SiteNameInfoBLOB field, stored as an unsigned, 32-bit, little-endian integer.

SiteNameInfoBLOB (variable): The BLOB containing the site name of the server in the SiteEntryBLOB.

2.3.3.1.1.4.1.1 SiteNameInfoBLOB

The SiteNameInfoBLOB contains the name of a site to which a server belongs.

0	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1
Flags																															
SiteNameSize																SiteName (variable)															

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...

Flags (4 bytes): This MUST be set to 0 on write. MUST be ignored on read.

SiteNameSize (2 bytes): The size, in bytes, of the **SiteName** field, stored as an unsigned, 16-bit, little-endian integer.

SiteName (variable): A string of Unicode characters representing the directory services site name of the server. The case of the **site** name, as provided by directory services, MUST be preserved when storing in this field.

2.3.4 Schema for Domainv2-Based DFS Namespace

Each domainv2-based DFS namespace has one DFS namespace anchor LDAP entry, one DFS namespace LDAP entry below it, and one LDAP entry per DFS link in the namespace under the DFS namespace LDAP entry. The following sections specify the mandatory and optional attributes of the object classes.

2.3.4.1 LDAP Entry for Domainv2-Based DFS Namespace Anchor

Each domainv2-based DFS namespace under the DFS configuration container has a DFS namespace anchor LDAP entry.

This object has a single attribute: **msDFS-SchemaMajorVersion**. This attribute is an integer value containing the major version number of the supported DFS metadata format.

The object class of the LDAP entry corresponding to the domainv2-based DFS namespace anchor is ms-DFS-Namespace-Anchor, and its schema is specified in [MS-ADSC]. The schema of the msDFS-SchemaMajorVersion attribute is specified in [MS-ADA2]. Future revisions of the DFS namespace will retain this LDAP entry to provide the DFS metadata version information of the DFS namespace.

2.3.4.2 LDAP Entry for Domainv2-Based DFS Namespace

A DFS namespace LDAP entry exists for each domainv2-based DFS namespace under the DFS namespace anchor LDAP entry.

This object has the following attributes. The schemas for these attributes are specified in [MS-ADA2].

Attribute	Description
msDFS-SchemaMajorVersion	An integer value that contains the major version number of the DFS metadata format supported.
msDFS-SchemaMinorVersion	An integer value that contains the minor version number of the DFS metadata format supported. The **rangeLower** attribute of the attribute schema's LDAP entry contains 0, and the **rangeUpper** attribute of the attribute schema's LDAP entry contains the highest minor version number supported.
msDFS-NamespaceIdentityGUIDv2	This is the time-stable identifier for a DFS namespace. It is a binary value set at DFS namespace creation time whose size is specified by the **rangeLower** and **rangeUpper** attributes.
msDFS-GenerationGUIDv2	A binary value whose size is specified by the **rangeLower** and **rangeUpper** attributes. This time-stable identifier is overwritten anytime the LDAP entry corresponding to the DFS namespace or the DFS link is modified. This is reserved for future use and MUST NOT be currently used.

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Attribute	Description
msDFS-LastModifiedv2	A time string format defined by ASN.1 standards, as specified in [X680]. The **Coordinated Universal Time (UTC)** in the form YYYYMMDDHHMMSS.0Z"0Z" indicates no time differential. This attribute is updated each time the DFS root is updated.
msDFS-Ttlv2	A 32-bit signed integer that is interpreted as an unsigned referral Time to Live (TTL), in seconds.
msDFS-TargetListv2	This attribute stores the DFS target information. The information is stored as an XML document that contains a list of targets for the root as well as attributes associated with each target. The maximum size is 2 MB. For the XML schema of the XML document, see Appendix C.
msDFS-Propertiesv2	This is a multivalued attribute that contains attributes corresponding to the DFS root. Each attribute is a case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2).
msDFS-Commentv2	An optional attribute that contains a comment associated with the DFS namespace root. A String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2).

Attribute values for **msDFS-Propertiesv2** are described in the following table. A server MUST ignore unrecognized attribute values when reading the metadata. A server SHOULD<19> preserve unrecognized attribute values when writing the metadata. Note that they are fixed strings. They have a more general appearance, but a string comparison is sufficient to analyze them. The absence of an attribute value in the **msDFS-Propertiesv2** attribute indicates that the corresponding property is not set.

For domainv2-based DFS namespaces, the **msDFS-Propertiesv2** attribute parallels the functionality of the DFSRootOrLinkIDBLOB (section 2.3.3.1.1.2) **Type** field used for domainv1-based namespaces.

Attribute Value	Description
ABDE=on	The Access Based Directory Enumeration (ABDE) mode property. Enables ABDE mode.
InsiteReferral=on	The DFS in-site referral mode property. When set, instructs the DFS server to enable the DFS in-site referral mode.
ReferralSiteCosting=on	The DFS referral site costing property. Enables DFS referral site costing and SHOULD be supported.<20>
RootScalability=on	The DFS root scalability mode property. This enables DFS root scalability mode and SHOULD be supported.<21>
TargetFailback=on	The DFS client target failback property. This enables DFS client target failback for targets of this root and SHOULD be supported.<22>
State=Okay	The DFS root is available for referral requests.

The following attributes are mandatory: msDFS-SchemaMajorVersion, msDFS-SchemaMinorVersion, msDFS-NamespaceIdentityGUIDv2, msDFS-GenerationGUIDv2, msDFS-LastModifiedv2, msDFS-Ttlv2, msDFS-TargetListv2, and msDFS-Propertiesv2.

The msDFS-Commentv2 attribute is optional.

The object class of the LDAP entry corresponding to the domainv2-based DFS namespace is msDFS-Namespacev2, and its schema is specified in [MS-ADSC].

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2.3.4.3 LDAP Entry for Domainv2-Based DFS Link

One LDAP entry exists for each DFS link in the namespace under the DFS namespace LDAP entry.

This object has the following attributes. The schemas for these attributes are specified in [MS-ADA2].

Attribute	Description
msDFS-NamespaceIdentityGUIDv2	This is the time-stable identifier for the DFS namespace containing the link, and matches the value specified in the namespace LDAP entry. It is a binary value set at DFS namespace creation time whose size is specified by the **rangeLower** and **rangeUpper** attributes.
msDFS-LinkIdentityGUIDv2	This is the time-stable identifier for a DFS link. It is a binary value set at DFS link creation time whose size is specified by the **rangeLower** and **rangeUpper** attributes. This value is retained in the **dynamic object** created when the link is deleted.
msDFS-GenerationGUIDv2	A binary value whose size is specified by the **rangeLower** and **rangeUpper** attributes. This time-stable identifier is overwritten anytime the LDAP entry corresponding to the DFS namespace or the DFS link is modified. This is reserved for future use and MUST NOT be currently used.
msDFS-LinkPathv2	A case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2) that is the DFS root-relative path to the DFS link **reparse point**. To simplify LDAP searches, path separators are forward slashes (/) instead of backward slashes (\).
msDFS-ShortNameLinkPathv2	A case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2) that is the DFS namespace root-relative path to the DFS link reparse point in short name form. To simplify LDAP searches, path separators are forward slashes (/) instead of backward slashes (\). This is reserved for future use and MUST NOT be currently used.
msDFS-LinkSecurityDescriptorv2	A self-relative security descriptor associated with a DFS link. This attribute is used for Access Based Directory Enumeration (ABDE) support.
msDFS-LastModifiedv2	A time string format defined by ASN.1 standards. The UTC time in the form YYYYMMDDHHMMSS.0Z"0Z" indicates no time differential. This attribute is updated each time the DFS link is updated.
msDFS-Ttlv2	A 32-bit signed integer that is interpreted as an unsigned referral TTL, in seconds.
msDFS-TargetListv2	This attribute stores the DFS target information. The information is stored as an XML document that contains a list of targets for the link as well as attributes associated with each target. The maximum size is 2 MB. For the XML schema of the XML document, see Appendix C.
msDFS-Propertiesv2	This is a multivalued attribute that contains attributes corresponding to the DFS link (not individual targets). Each attribute is a case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2).
msDFS-Commentv2	An optional attribute that contains a comment associated with the DFS link. A String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2).

Attribute values for **msDFS-Propertiesv2** are described in the following table. A server MUST ignore unrecognized attribute values when reading the metadata. A server SHOULD<23> preserve unrecognized attribute values when writing the metadata. Note that they are fixed strings. While they have a more general appearance, a string comparison is sufficient to analyze them. The absence of an attribute value in the **msDFS-Propertiesv2** attribute indicates that the corresponding property is not set.

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For domainv2-based DFS links, the **msDFS-Propertiesv2** attribute parallels the functionality of the DFSRootOrLinkIDBLOB (section 2.3.3.1.1.2) **Type** field used for domainv1-based DFS links.

Attribute Value	Description
InsiteReferral=on	The DFS in-site referral mode property. When set, instructs the DFS server to enable the DFS in-site referral mode.
ReferralSiteCosting=on	The DFS referral site costing property. Enables DFS referral site costing. This SHOULD be supported.<24>
TargetFailback=on	The DFS client target failback property. This enables DFS client target failback for targets of this link. This SHOULD be supported.<25>
Interlink=on	The DFS interlink property. This MUST be set only when at least one DFS link target points to another domain-based DFS namespace.
State=Okay OR State=Offline OR State=Online	The state of the DFS link. "State=Okay" means that the DFS link is available for referral requests. "State=Offline" means that the DFS link is offline and none of the DFS targets will be included in the referral response. "State=Online" means that the DFS link is online and available for referral requests.

The following attributes are mandatory: **msDFS-NamespaceIdentityGUIDv2**, **msDFS-LinkIdentityGUIDv2**, **msDFS-GenerationGUIDv2**, **msDFS-LinkPathv2**, **msDFS-LastModifiedv2**, **msDFS-Ttlv2**, **msDFS-TargetListv2**, and **msDFS-Propertiesv2**.

The following attributes are optional: **msDFS-ShortNameLinkPathv2**, **msDFS-LinkSecurityDescriptorv2**, and **msDFS-Commentv2**.

The object class of the LDAP entry corresponding to a DFS link in a domainV2-based DFS namespace is msDFS-Linkv2, and its schema is specified in [MS-ADSC].

2.3.4.4 LDAP Entry for Domainv2-Based Deleted Link

Only one LDAP entry corresponds to a deleted link in a domainv2-based DFS namespace. This is a dynamic object.

This object has the following attributes. The schemas for these attributes are specified in [MS-ADA2].

Attribute	Description
msDFS-NamespaceIdentityGUIDv2	This is the time-stable identifier for the DFS namespace containing the link, and it matches the value specified in the namespace LDAP entry. It is a binary value set at DFS namespace creation time whose size is specified by the **rangeLower** and **rangeUpper** attributes.
msDFS-LinkIdentityGUIDv2	This is the time-stable identifier for a DFS link. It is a binary value set at DFS link creation time whose size is specified by the **rangeLower** and **rangeUpper** attributes. This value is retained in the dynamic object created when the link is deleted.
msDFS-LastModifiedv2	A time string format defined by ASN.1 standards. The UTC time in the form YYYYMMDDHHMMSS.0Z"0Z" indicates no time differential. This attribute is updated each time the DFS link entry is updated.
msDFS-LinkPathv2	A case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2) that is the DFS root-relative path to the DFS link reparse point. To simplify LDAP searches, path separators are forward slashes (/) instead of backward slashes (\).

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Attribute	Description
msDFS-Commentv2	An optional attribute that contains a comment associated with the DFS namespace link. A case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2).
msDFS-ShortNameLinkPathv2	A case-insensitive String(Unicode) (see [MS-ADTS] section 3.1.1.2.2.2) that is the DFS namespace root-relative path to the DFS link reparse point in short name form. To simplify LDAP searches, path separators are forward slashes (/) instead of backward slashes (\). This is reserved for future use and MUST NOT be currently used.

The following attributes are mandatory: msDFS-NamespaceIdentityGUIDv2, msDFS-LinkIdentityGUIDv2, msDFS-LastModifiedv2, and msDFS-LinkPathv2.

The following attributes are optional: msDFS-Commentv2 and msDFS-ShortNameLinkPathv2.

The object class of the LDAP entry corresponding to a DFS link in a domainv2-based DFS namespace is msDFS-DeletedLinkv2, and its schema is as specified in [MS-ADSC].

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3 Protocol Details

3.1 Server Details

3.1.1 Abstract Data Model

This section describes a conceptual model of a possible data organization that an implementation could maintain in order to participate in this protocol. This organization is provided to facilitate the explanation of how the protocol behaves. This specification does not mandate that implementations adhere to this model, as long as their external behavior is consistent with that described in this document. The following data items are implemented on the server side and are specific to this protocol:

- **PDCRoleHolder:** For servers of domain-based DFS namespaces, this is the PDC corresponding to the server's domain.
- **DFSMetadataCache:** DFS metadata of DFS namespaces for which the server is a root target MAY<26> be cached as an optimization.

Note The preceding conceptual data can be implemented using a variety of techniques. There are no limitations on data implementation.

3.1.1.1 Global

The following element is global.

NamespaceList: A list of namespaces hosted by the server. Each entry is a tuple of <**NamespaceName**, **Namespace**>, indexed by the **NamespaceName**, as specified in section 3.1.1.2.

3.1.1.2 Per Namespace

The following are the elements of a **Namespace** element:

Namespace.NamespaceName: The DFS namespace name.

Namespace.NamespaceType: Type of the DFS namespace – stand-alone, domainv1-based or domainv2-based.

Namespace.GenerationGUID: A GUID used as a generation number to detect changes to the DFS metadata. This MUST be updated whenever the metadata of the DFS namespace is changed.

Namespace.NamespaceElementsList: List of the DFS namespace elements as described in section 3.1.1.3.

3.1.1.3 Per NamespaceElement

The **NamespaceElement** represents a DFS root or a DFS link and has the following parameters:

NamespaceElement.IdentityGUID: A GUID that identifies the DFS namespace element.

NamespaceElement.Prefix: Name of the DFS namespace element.

NamespaceElement.Properties: Set of properties that are applicable for the DFS namespace element, as specified for **PropertyFlags** in section 2.2.3.5.

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NamespaceElement.State: State of the DFS namespace element, as specified for **State** in section 2.2.3.2.

NamespaceElement.Comment: Comment associated with the DFS namespace element.

NamespaceElement.ReferralTTL: The referral time-out value, in seconds, for the DFS namespace element.

NamespaceElement.SecurityDescriptor: SecurityDescriptor to be associated with the DFS namespace element. This is needed only for the DFS link of a stand-alone or domainv2-based DFS namespace.

NamespaceElement.TargetsList: List of targets for the DFS namespace element. Each element in the list is as described in section 3.1.1.4.

3.1.1.4 Per TargetsList

The following are the elements of a **TargetsList**.

TargetsList.TargetCount: Number of targets for the DFS namespace element.

TargetsList.Target: Metadata of the target. This is as described in the section 3.1.1.5.

3.1.1.5 Per Target

The following are the elements of a **Target** element.

Target.TargetState: State of the target, as specified for State in section 2.2.4.6.

Target.PriorityRank: Priority rank of the target, as specified for TargetPriorityRank in section 2.2.2.7.

Target.PriorityClass: Priority class of the target, as specified in section 2.2.2.8.

Target.ServerName: The DFS target host name.

Target.ShareName: The DFS target share name.

3.1.2 Timers

No protocol timers are required beyond those used internally by RPC to implement resiliency to network outages, as specified in [MS-RPCE].

3.1.3 Initialization

The server MUST listen on the well-known endpoint defined for this RPC interface, as specified in section 2.1.

Information about DFS namespaces that the server hosts SHOULD be obtained from a local information store such as the registry. An entry MUST be created for each namespace in the **NamespaceList**. If the server is hosting any stand-alone namespaces, the metadata for that namespace MUST be initialized into the corresponding **Namespace** in the **NamespaceList**. If the server is joined to a domain and is hosting at least one DFS namespace, it MAY<27> determine the PDC for the domain and initialize PDCRoleHolder. As a performance optimization, it MAY<28> preload the DFSMetadataCache with the DFS metadata of the DFS namespaces for which it is acting as a root target.

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3.1.4 Message Processing Events and Sequencing Rules

When any RPC method is received for a domain-based DFS namespace that is hosted by the server, the server MUST first check whether the DFS namespace is up-to-date with any changes that may have happened on it. This check MUST be done against the PDC. When any changes are detected, the server MUST first bring the namespace it hosts up-to-date and then process the RPC method received. The details of this operation are implementation-specific.

For a domainv1-based DFS namespace, if the **pKTGuid** value matches the cached value, the server MAY work on a cached copy of the **pKT** attribute. The update operation MUST be committed by issuing LDAP writes for both the updated **pKT** attribute and a newly generated **pKTGuid** attribute. Using the same LDAP update operation for both attributes ensures atomicity of the update.

For non-update operations in domain-based DFS namespaces, DFS servers MAY retrieve DFS metadata from any DC within the domain. For update operations in domain-based DFS namespaces, DFS servers MUST retrieve and store DFS metadata on the PDC.

Unless noted otherwise, DFS servers MUST process host names as case-insensitive string literals. The DFS server MUST NOT, for example, consider a DNS-conformant host name (as specified in [RFC1034]) and an IP address as equivalent, even if the host name resolves via DNS to the IP address.

This protocol uses Win32 error codes. These values are taken from the Windows error number space, as specified in [MS-ERREF]. Vendors SHOULD reuse those values with their indicated meanings. Choosing any other value runs the risk of future collisions.<29>

The remainder of this section describes the methods used in the DFS: Namespace Management Protocol. The following table lists opnum values associated with the methods described in this document, as well as the section where each is described.

Methods in RPC Opnum Order

Method	Description
NetrDfsManagerGetVersion	A basic method that returns the version number of the DFS server. Opnum: 0
NetrDfsAdd	A basic method that creates a new DFS link or that adds a new target to an existing link of a DFS namespace. Opnum: 1
NetrDfsRemove	A basic method that removes a link or a link target from a DFS namespace. Opnum: 2
NetrDfsSetInfo	A basic method that sets or modifies information relevant to a specific DFS root, DFS root target, DFS link, or DFS link target. Opnum: 3
NetrDfsGetInfo	A basic method that returns information about a DFS root, a DFS link, or a DFS namespace. Opnum: 4
NetrDfsEnum	A basic method that enumerates the DFS roots hosted on a server or the DFS links of a namespace on the server. Opnum: 5
NetrDfsMove	A basic method that renames or moves one or more DFS links. <30> Opnum: 6

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Method	Description
Opnum7NotUsedOnWire	Reserved for local use. Opnum: 7
Opnum8NotUsedOnWire	Reserved for local use. Opnum: 8
Opnum9NotUsedOnWire	Reserved for local use. Opnum: 9
NetrDfsAddFtRoot	A root target method that creates a new domainv1-based DFS namespace or that adds a root target to an existing namespace. Opnum: 10
NetrDfsRemoveFtRoot	A root target method that removes a root target from a domain-based DFS namespace or that removes a domain-based DFS namespace. Opnum: 11
NetrDfsAddStdRoot	A stand-alone namespace method that creates a new stand-alone DFS namespace. Opnum: 12
NetrDfsRemoveStdRoot	A stand-alone namespace method that deletes a stand-alone DFS namespace. Opnum: 13
NetrDfsManagerInitialize	A basic method that instructs the DFS server to discard its current state and to reinitialize itself from its stored configuration settings. Opnum: 14
NetrDfsAddStdRootForced	A stand-alone namespace method that creates a new stand-alone DFS namespace without verifying the existence of the DFS root target share. Opnum: 15
NetrDfsGetDcAddress	A domain-based namespace method that returns the host name of the DC for the client to use during the following processes: creating a domain-based DFS namespace, adding a root target to a domain-based DFS namespace, removing a root target from a domain-based DFS namespace, or removing a domain-based DFS namespace. Opnum: 16
NetrDfsSetDcAddress	A domain-based namespace method that instructs a DFS server to use a specific DC for DFS metadata access in a domain-based DFS namespace. Opnum: 17
NetrDfsFlushFtTable	A root target method that instructs the DFS server on a DC to purge a domain-based DFS entry from its referral cache. Opnum: 18
NetrDfsAdd2	An extended method that creates a new DFS link or that adds a new target to an existing link of a DFS namespace. Opnum: 19
NetrDfsRemove2	An extended method that removes a link or a link target. Opnum: 20
NetrDfsEnumEx	An extended method that enumerates DFS roots hosted on a machine

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Method	Description
	or DFS links of a namespace. Opnum: 21
NetrDfsSetInfo2	An extended method that sets or modifies the information that is associated with a DFS root, a DFS root target, a DFS link, or a DFS link target. Opnum: 22
NetrDfsAddRootTarget	A basic method that creates a stand-alone DFS namespace, a domainv1-based DFS namespace, or a domainv2-based DFS namespace.<31> Opnum: 23
NetrDfsRemoveRootTarget	A basic method that deletes a stand-alone DFS namespace, a domainv1-based DFS namespace, or a domainv2-based DFS namespace.<32> Opnum: 24
NetrDfsGetSupportedNamespaceVersion	A basic method that determines the supported DFS metadata version number. This method is useful in determining an appropriate version number to pass to the NetrDfsAddRootTarget() method.<33> Opnum: 25

In the preceding table, the term "Reserved for local use" means that the client MUST NOT send the opnum, and the server behavior is undefined<34> because it does not affect interoperability.

3.1.4.1 Basic Methods

3.1.4.1.1 NetrDfsManagerInitialize (Opnum 14)

The NetrDfsManagerInitialize method instructs the DFS server to discard its current state and reinitialize itself from its stored configuration settings. The server SHOULD<35> choose to implement this method.

The NetrDfsManagerInitialize method has the following **Microsoft Interface Definition Language (MIDL)** syntax.

```
NET_API_STATUS NetrDfsManagerInitialize(
  [in, string] WCHAR* ServerName,
  [in] DWORD Flags
);
```

ServerName: The pointer to a null-terminated Unicode host name string of the DFS root target server or DC where the DFS service is to be reinitialized.

Flags: This parameter MUST be zero.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.

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Return value/code	Description
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000032 ERROR_NOT_SUPPORTED	Server does not support the requested operation.

If this method is implemented, the DFS server SHOULD<36> discard its current state and reinitialize itself from its stored configuration settings.

3.1.4.1.2 NetrDfsManagerGetVersion (Opnum 0)

The NetrDfsManagerGetVersion method returns the version number of the DFS server in use on the server.

The NetrDfsManagerGetVersion method has the following MIDL syntax.

```
DWORD NetrDfsManagerGetVersion();
```

This method has no parameters.

Return Values: This method MUST return one of the following values.

Return value	Description
0x00000001	The server MUST support stand-alone DFS namespaces and opnums from 0 through 5, inclusive. The server MAY support domain-based DFS namespaces and other opnums.
0x00000002	In addition to the preceding, the server MUST support domainv1-based DFS namespaces and opnums 10 through 22, inclusive. The server MAY support hosting more than one DFS namespace on the same server.
0x00000004	In addition to the preceding, the server MUST support hosting more than one DFS namespace on the same server and Level parameter value 200 of the NetrDfsEnumEx method. It SHOULD support opnum 6.
0x00000006	In addition to the preceding, the server MUST support domainv2-based DFS namespace and opnums 23 through 25, inclusive.

The clients MAY use the version information to determine the RPC methods that the DFS server supports.<37><38><39><40><41>

3.1.4.1.3 NetrDfsAdd (Opnum 1)

The NetrDfsAdd method creates a new DFS link or adds a new target to an existing link of a DFS namespace.

The NetrDfsAdd (Opnum 1) method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsAdd(
  [in, string] WCHAR* DfsEntryPath,
  [in, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in, unique, string] WCHAR* Comment,
  [in] DWORD Flags
);
```


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DfsEntryPath: The pointer to a DFS link path that contains the name of an existing link when additional link targets are being added or the name of a new link is being created.

ServerName: The pointer to a null-terminated Unicode string that specifies the DFS link target host name.

ShareName: The pointer to a null-terminated Unicode DFS link target share name string. This may also be a share name with a path relative to the share, for example, "share1\mydir1\mydir2". When specified this way, each pathname component MUST be a directory.

Comment: The pointer to a null-terminated Unicode string that contains a comment associated with this root or link. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality. The comment MUST be ignored when adding a target to an existing link.

Flags: A value indicating the operation to perform. The following table lists such flags.

Value	Meaning
0x00000000	Create a new link or adds a new target to an existing link.
DFS_ADD_VOLUME 0x00000001	Create a new link in the DFS namespace if one does not already exist or fails if a link already exists.
DFS_RESTORE_VOLUME 0x00000002	Add a target without verifying its existence.

If a *Flags* value other than the bitwise-OR of the above values is provided, the server MUST return ERROR_INVALID_PARAMETER (0x00000057).

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000050 ERROR_FILE_EXISTS	The specified DFS link target already exists.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS root namespace does not exist.
0x00000032 ERROR_NOT_SUPPORTED	The method does not support a domain-based namespace.
0x00000906 NERR_NetNameNotFound	The DFS link target does not exist.

The NetrDfsAdd method SHOULD<42> support a domain-based DFS namespace. If it does not support a domain-based DFS namespace it MUST return ERROR_NOT_SUPPORTED.

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The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify whether the link to be added overlaps an existing link. If there is a link for which the specified *DfsEntryPath* parameter is a prefix, the server MUST return ERROR_FILE_EXISTS.

If the link to be added already exists, and DFS_ADD_VOLUME is set in the **Flags** field of the request, the server MUST return ERROR_FILE_EXISTS.

If the link to be added already exists, and DFS_ADD_VOLUME is not set in the **Flags** field of the request, the server MUST attempt to add a new link target to the link. If a target with the path specified by *ServerName* and *ShareName* was already added to the link, the server MUST return ERROR_FILE_EXISTS.

If DFS_RESTORE_VOLUME is not specified on the *Flags* parameter, the server MAY<43> choose to verify whether the link target exists. If DFS_RESTORE_VOLUME is specified, the server MUST NOT perform this test. If it performs the test and the link target does not exist, the server MUST fail the call with NERR_NetNameNotFound.

The exact test the server performs to verify link target existence is implementation-defined. A server MAY,<44> for example, assume all link targets are administered through [MS-SRVS] section 3.1.4.10 and use NetShareGetInfo level 1005 to perform the test. Three reasons not to implement this test are that

- It may not be practical to determine the correct administration interface to query to perform the test.
- A link target server may export a share with a network protocol and administration interface that this server does not understand.
- A secured link target server may not permit this server to contact it.

The *Comment* parameter MUST be ignored when a target is added to an existing link.

The server SHOULD<45> create a new link without requiring the *DFS_ADD_VOLUME Flags* parameter.

The server MUST determine whether the specified link target refers to a domain-based namespace. If it does, this request is creating a DFS interlink. If it is creating an interlink and the link already exists, the server MUST return an implementation-defined failure value. For domain-based namespaces, the server MUST set the DFS interlink property as appropriate for the link for each type of domain-based namespace. See sections 2.3.3.1.1.2 and 2.3.4.3.

The server MUST synchronously update the following fields in the DFS metadata for a stand-alone DFS namespace.

Operation	DFS metadata changes required
Adding a new link	New **NamespaceElement** in **NamespaceElementsList**.
Adding a new target to an existing link	New **Target** in the **TargetsList** of the **NamespaceElement** and an update to the **TargetCount**.

The server MUST update the following fields in the DFS metadata for a domainv1-based DFS namespace.

Operation	DFS metadata changes required
Adding a new link	New DFSNamespaceLinkBLOB and BLOBElementCount.
Adding a new target to	New TargetEntryBLOB and updated TargetCount in existing DFSTargetListBLOB,

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Operation	DFS metadata changes required
an existing link	updated DFSTargetListBLOBSize and BLOBDataSize of DFSNamespaceLinkBLOB.

The server MUST update the following fields in the DFS metadata for a domainv2-based DFS namespace.

Operation	DFS metadata changes required
Adding a new link	The following mandatory attributes MUST be updated: msDFS-NamespaceIdentityGUIDv2, msDFS-LinkIdentityGUIDv2, msDFS-GenerationGUIDv2, msDFS-LinkPathv2, msDFS-LastModifiedv2, msDFS-TargetListv2, msDFS-Propertiesv2, and msDFS-Ttlv2. The following optional attribute MAY be updated: msDFS-Commentv2.<46>
Adding a new target to an existing link	Update **targetCount**, **totalStringLengthInBytes**, **priority**, and **state** attributes in msDFS-TargetListv2. Update msDFS-LastModifiedv2.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the Level parameter 101, and with the State field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.<47><48>

3.1.4.1.4 NetrDfsRemove (Opnum 2)

The NetrDfsRemove method removes a link or a link target from a DFS namespace. A link can be removed regardless of the number of targets associated with it.

The NetrDfsRemove method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsRemove(
  [in, string] WCHAR* DfsEntryPath,
  [in, unique, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName
);
```

DfsEntryPath: The pointer to the DFS link path that contains the name of an existing link.

ServerName: The pointer to a null-terminated Unicode DFS link target host name string. Clients MUST set *ServerName* to a NULL pointer in requests to remove the link and all its link targets.

ShareName: The pointer to a null-terminated Unicode DFS link target share name string. This may also be a share name with a path relative to the share, for example, "share1\mydir1\mydir2". Clients MUST set *ShareName* to a NULL pointer in requests to remove the link and all its link targets.

Return Values: This method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000002	The specified DFS link target was not found as a target of the specified

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Return value/code	Description
ERROR_FILE_NOT_FOUND	DFS link.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000032 ERROR_NOT_SUPPORTED	The method does not support a domain-based namespace.
0x00000490 ERROR_NOT_FOUND	The specified DFS namespace or DFS link does not exist.

The NetrDfsRemove method SHOULD<49> support a domain-based DFS namespace. If it does not support a domain-based DFS namespace it MUST return ERROR_NOT_SUPPORTED.

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link target of the DFS link that the *ServerName* and *RootShare* parameters specify. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

If the *ServerName* and *ShareName* parameters are both NULL, the server MUST remove the link and all its link targets. If the *ServerName* and *ShareName* are not NULL, the server MUST remove the specified link target. If the specific target is the last target of the link, the server MUST remove the link as well. If only one of *ServerName* or *ShareName* is NULL, the server MUST return ERROR_INVALID_PARAMETER.

The server MUST synchronously update the following fields in the DFS metadata for a stand-alone DFS namespace.

Operation	DFS metadata changes required
Remove link	Remove corresponding **NamespaceElement** from **NamespaceElementsList**.
Remove link target	Remove **Target** from the **TargetsList** of the **NamespaceElement**, and update the **TargetCount**.

The server MUST update the following fields in the DFS metadata for a domainv1-based DFS namespace.

Operation	DFS metadata changes required
Remove link	Remove DFSNamespaceLinkBLOB; update BLOBElementCount.
Remove link target	Update TargetCount in existing DFSTargetListBLOB, remove TargetEntryBLOB. Update DFSTargetListBLOBSize, update BLOBDataSize of DFSNamespaceLinkBLOB.

The server MUST update the following fields in the DFS metadata for a domainv2-based DFS namespace.

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Operation	DFS metadata Changes Required
Remove link	Remove the DFS link object.
Remove link target	Update **TargetCount** and **totalStringLengthInBytes** attributes in msDFS-TargetListv2; update msDFS-LastModifiedv2.

A remove link operation in a domainv2-based DFS namespace first creates a dynamic object for the entry to be deleted. To create a dynamic object, the server MUST do the following:

- Set the object class to msDFS-DeletedLinkv2; a normal DFS link LDAP entry's object class is msDFS-Linkv2.
- Set the deleted DFS link's identity GUID.
- Set an updated msDFS-LastModifiedv2 time-stamp attribute.

If the dynamic object is created successfully, the original link LDAP entry is then deleted. If the delete is successful, the dynamic object is left intact; otherwise, the dynamic object is itself deleted. The advantage of using a dynamic object is that directory services perform garbage collection.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo method with the *Level* parameter 101, and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.<50><51>

3.1.4.1.5 NetrDfsSetInfo (Opnum 3)

The NetrDfsSetInfo method sets or modifies information relevant to a specific DFS root, DFS root target, DFS link, or DFS link target.

The NetrDfsSetInfo method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsSetInfo(
  [in, string] WCHAR* DfsEntryPath,
  [in, unique, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in] DWORD Level,
  [in, switch_is(Level)] DFS_INFO_STRUCT* DfsInfo
);
```

DfsEntryPath: The pointer to a DFS root or a DFS link path.

ServerName: The pointer to a null-terminated Unicode DFS root target or DFS link target host name string. Clients MUST set this to a NULL pointer when the DFS root or DFS link is used and not the DFS root target or DFS link target.

ShareName: The pointer to a null-terminated Unicode string DFS root target or DFS link target host name. Clients MUST set this to a NULL pointer when the DFS root or DFS link is used and not the DFS root target or DFS link target.

Level: Specifies the information level of the data and, in turn, determines the action the method performs.

Value	Meaning
Level_100	Sets the comment associated with the root or link specified in the *DfsInfo* parameter. The

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Value	Meaning
0x00000064	*ServerName* and *ShareName* parameters MUST be NULL.
Level_101 0x00000065	Sets the state associated with the root, link, root target, or link target specified in *DfsInfo*.<52>
Level_102 0x00000066	Sets the time-out value associated with the root or link specified in *DfsInfo*. The *ServerName* and *ShareName* parameters MUST be ignored.
Level_103 0x00000067	Sets the property flags for the root or link specified in *DfsInfo*. The *ServerName* and *ShareName* parameters MUST be NULL.
Level_104 0x00000068	Sets the target priority rank and class for the root target or link target specified in *DfsInfo*.
Level_105 0x00000069	Sets the comment, state, time-out information, and property flags for the namespace root or link specified in *DfsInfo*. Does not apply to a root target or link target. The *ServerName* and *ShareName* parameters MUST be NULL.
Level_106 0x0000006A	Sets the target state and priority for the DFS root target or DFS link target specified in *DfsInfo*.<53> This does not apply to the DFS namespace root or link.
Level_107 0x0000006B	Sets the comment, state, time-out, security descriptor information, and property flags for the namespace root or link specified in *DfsInfo*. Does not apply to a root target or link target. The *ServerName* and *ShareName* parameters MUST be NULL. The security descriptor MUST NOT have owner, group, or **SACLs** in it. The security descriptor MUST be a NULL, zero length value if used on a namespace root. In this case, note that it is equivalent to using Level_105.
Level_150 0x00000096	Sets the security descriptor associated with a DFS link. Only stand-alone DFS namespaces and domainv2-based DFS namespaces are supported. The *ServerName* and *ShareName* parameters MUST both be NULL. The security descriptor MUST NOT have owner, group, or SACLs in it.

The server MUST support Level values 100 and 101. The server SHOULD support Level values 102-107 and 150. If the server does not support the provided Level, it MUST fail the call.<54> The server SHOULD return error code ERROR_INVALID_PARAMETER for unsupported level values.<55>

DfsInfo: The pointer to a DFS_INFO_STRUCT union that contains the specified data. The value of the *Level* parameter selects the case of the union.

Return Values: This method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF], section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000002 ERROR_FILE_NOT_FOUND	The specified DFS link target was not found as a target of the specified DFS link.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000032 ERROR_NOT_SUPPORTED	The specified operation is not supported.

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Return value/code	Description
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS root namespace or DFS link, or DFS link or root target, does not exist.

The NetrDfsSetInfo method SHOULD<56> support a domain-based DFS namespace. If it does not support a domain-based DFS namespace it MUST return ERROR_NOT_SUPPORTED.

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link that the *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link target of the DFS link that the *ServerName* and *RootShare* parameters specify. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

The server MUST fail any attempt to set the state of a DFS root, a DFS link, a DFS root target or a DFS link target to a value that is not specified for the *Level* parameter. The server MUST fail any attempt to set the property flags on a DFS link that are defined only for a DFS root.

When the *Level* parameter is 101 and the **State** field in the DFS_INFO_101 structure is DFS_VOLUME_STATE_RESYNCHRONIZE, the server MUST reload the contents of the DFSMetadataCache for the DFS namespace that the *ShareName* parameter specifies. It MUST then update its local DFS namespace information by comparing this information against the DFS metadata. The details of this update operation are implementation-dependent.

When level 107 is used for a DFS namespace root or for a domainv1-based DFS link, the *pSecurityDescriptor* parameter has no meaning because security descriptors cannot be associated with those objects. In these cases, if *pSecurityDescriptor* is not NULL, the server MUST fail with ERROR_NOT_SUPPORTED.

For domainv1-based DFS root, if the **Level** in the **DfsInfo** structure is 103, 105, or 107, and if the **PropertyFlagMask** field has the DFS_PROPERTY_FLAG_ABDE flag set, the server MUST fail the call with ERROR_NOT_SUPPORTED.

If the **Level** in the **DfsInfo** structure is 103, 105, or 107, and if **PropertyFlagMask** field has DFS_PROPERTY_FLAG_CLUSTER_ENABLED flag set, the server MUST fail the call with ERROR_NOT_SUPPORTED.

The server MUST synchronously update the following fields in the DFS metadata for a stand-alone DFS namespace, depending on the value of the *Level* parameter.

Value	DFS metadata changes required
100 (0x00000064)	Update **Comment** in the **NamespaceElement**.
101 (0x00000065)	If a link, update the **State** field of **NamespaceElement**. If a root target or link target, update the **TargetState** field of **Target**.
102 (0x00000066)	Update the **ReferralTTL** field of **NamespaceElement**.
103	Update the **Properties** field of **NamespaceElement**.

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Value	DFS metadata changes required
(0x00000067)	
104 (0x00000068)	Update the **PriorityRank** and **PriorityClass** fields of **Target**.
105 (0x00000069)	Update the **Comment**, **State**, **ReferralTTL**, and **Properties** fields of **NamespaceElement**.
106 (0x0000006A)	Update the **PriorityRank**, **PriorityClass**, and **TargetState** fields of **Target**.
107 (0x0000006B)	Update the **Comment**, **State**, **ReferralTTL**, **SecurityDescriptor**, and **Properties** fields of **NamespaceElement**.
150 (0x00000096)	Update **SecurityDescriptor** of the **NamespaceElement**.

The server MUST update the following fields in the DFS metadata for a domainv1-based DFS namespace, depending on the value of the *Level* parameter.

Value	DFS metadata changes required
100 (0x00000064)	Update **CommentSize** and **Comment** in DFSRootOrLinkIDBLOB and BLOBDataSize of DFSNamespaceLinkBLOB.
101 (0x00000065)	If a link, update the **State** field of DFSRootOrLinkIDBLOB. If a root target or link target, update the **TargetState** field of TargetEntryBLOB.
102 (0x00000066)	Update the **ReferralTTL** field of DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB.
103 (0x00000067)	Update the **Type** field of DFSRootOrLinkIDBLOB.
104 (0x00000068)	Update the **PriorityRank** and **PriorityClass** fields of TargetEntryBLOB.
105 (0x00000069)	Update **CommentSize** and **Comment** in DFSRootOrLinkIDBLOB, the **State** field of DFSRootOrLinkIDBLOB, the **ReferralTTL** field of DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB, and the **Type** field of DFSRootOrLinkIDBLOB.
106 (0x0000006A)	Update the **PriorityRank**, **PriorityClass**, and **TargetState** fields of TargetEntryBLOB.
107 (0x0000006B)	See 105 (0x00000069).

If the server does not support levels 104 or 106, it MUST use the FILETIME encoding for the **TargetTimestamp** field of the TargetEntryBLOB and update the field for each modified TargetEntryBLOB, as specified in section 2.3.3.1.1.3.1.

If the server supports levels 104 and 106, it MUST instead use the encoding which provides the **PriorityRank** and **PriorityClass** in the **TargetTimestamp** field.

Note that for interoperability, all root targets of a namespace SHOULD use the same encoding for this **TargetTimestamp** field.

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The server MUST update the following fields in the DFS metadata for a domainv2-based DFS namespace, depending on the value of the *Level* parameter. For information about these fields, see section 2.3.4.

Value	DFS metadata changes required
100 (0x00000064)	Update msDFS-Commentv2.
101 (0x00000065)	**State** field of msDFS-TargetListv2.
102 (0x00000066)	Update msDFS-Ttlv2.
103 (0x00000067)	Update msDFS-Propertiesv2.
104 (0x00000068)	Update the **priorityClass** and **priorityRank** attributes in msDFS-TargetListv2.
105 (0x00000069)	Update msDFS-Commentv2, msDFS-Ttlv2, msDFS-Propertiesv2, and the State field of msDFS-Targetlistv2.
106 (0x0000006A)	Update priorityClass, priorityRank, and the State field of msDFS-TargetListv2.
107 (0x0000006B)	Update msDFS-Commentv2, msDFS-Ttlv2, msDFS-Propertiesv2, msDFS-LinkSecurityDescriptorv2, and the State field of msDFS-TargetListv2.
150 (0x00000096)	Update msDFS-LinkSecurityDescriptorv2.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

For domainv2-based or standalone DFS root, if the DFS_PROPERTY_FLAG_ABDE flag in **NamespaceElement.Properties** is either set or cleared as a result of this method, the server MUST communicate with the local SMB service to enable (DFS_PROPERTY_FLAG_ABDE set) or disable (DFS_PROPERTY_FLAG_ABDE cleared) the Access-Based Directory Enumeration property on the DFS root target by calling the **NetrShareSetinfo** method using Level 1005 (as specified in [MS-SRVS] section 3.1.4.11).

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo method with the *Level* parameter 101, and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.<57>

3.1.4.1.6 NetrDfsGetInfo (Opnum 4)

The NetrDfsGetInfo method returns information about a DFS root or a DFS link of the specified DFS namespace.

The NetrDfsGetInfo method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsGetInfo(
  [in, string] WCHAR* DfsEntryPath,
  [in, unique, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in] DWORD Level,
  [out, switch is(Level)] DFS_INFO_STRUCT* DfsInfo
);
```


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DfsEntryPath: The pointer to a DFS root or a DFS link path.

ServerName: This parameter MUST be a NULL pointer for Level_50 and MUST be ignored for other levels.

ShareName: This parameter MUST be a NULL pointer for Level_50 and MUST be ignored for other levels.

Level: This parameter specifies the information level of the data and, in turn, determines the action the method performs.

Value	Meaning
Level_1 0x00000001	Returns the name of the DFS root or the DFS link.
Level_2 0x00000002	Returns the name, comment, state, and number of targets for the DFS root or the DFS link.
Level_3 0x00000003	Returns the name, comment, state, number of targets, and target information for the DFS root or the DFS link.
Level_4 0x00000004	Returns the name, comment, state, time-out, GUID, number of targets, and target information for the DFS root or the DFS link.
Level_5 0x00000005	Returns the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets for the DFS root or the DFS link.
Level_6 0x00000006	Returns the name, comment, state, GUID, time-out, property flags, metadata size, number of targets, and target information for the DFS root or the DFS link.
Level_7 0x00000007	Returns the version number GUID of the DFS metadata. This value only applies to the DFS root.
Level_8 0x00000008	Returns the name, comment, state, time-out, GUID, property flags, metadata size, number of targets, and security descriptor associated with the DFS root or the DFS link. Only stand-alone DFS namespaces and domainv2-based DFS namespaces are supported.
Level_9 0x00000009	Returns the name, comment, state, GUID, time-out, property flags, metadata size, number of targets, list of targets, and security descriptor for the DFS root or the DFS link. Only stand-alone DFS namespaces and domainv2-based DFS namespaces are supported.
Level_50 0x00000032	Returns the DFS metadata version and capability information of an existing DFS namespace. This level is valid only for the DFS namespace root, not for DFS links. The *ServerName* and *ShareName* parameters MUST both be NULL.<58>
Level_100 0x00000064	Returns the comment associated with the root or DFS link specified in the *DfsEntryPath* parameter.
Level_150 0x00000096	Returns the security descriptor associated with a DFS link. Only stand-alone DFS namespaces and domainv2-based DFS namespaces are supported.

The server MUST support Level values 1-3 and 100. The server SHOULD support Level values 4-9, 50 and 150. If the server does not support the provided Level, it MUST fail the call.<59> The server SHOULD return error code ERROR_INVALID_PARAMETER for unsupported Level values.<60>

DfsInfo: The pointer to a DFS_INFO_STRUCT union to receive the returned information. The case of the union is selected by the value of the *Level* parameter.

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Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000032 ERROR_NOT_SUPPORTED	The specified operation is not supported.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS root or DFS link, or DFS link or root target does not exist.

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link that the *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

Value	DFS metadata field
1 (0x00000001)	The **Prefix** field of **NamespaceElement**.
2 (0x00000002)	In addition to those for Level 1: the **Comment** and **State** fields of **NamespaceElement** and the **TargetCount** field of **TargetsList**.
3 (0x00000003)	In addition to those for Level 2: **Target** entries in the **TargetsList**.
4 (0x00000004)	In addition to those for Level 3: the **ReferralTTL** and **IdentityGUID** fields of **NamespaceElement**.
5 (0x00000005)	In addition to those for Level 4: the **Properties** field of **NamespaceElement**, and the size of the DFS namespace metadata,<61> but excluding **Target** entries.
6 (0x00000006)	In addition to those for Level 5: **Target** entries in the **TargetsList**.
7 (0x00000007)	The value of **GenerationGUID** attribute of the **Namespace** object.
8 (0x00000008)	In addition to those for Level 5: **SecurityDescriptor** of the **NamespaceElement**.
9 (0x00000009)	In addition to those for Level 6: **SecurityDescriptor** of the **NamespaceElement**.
50 (0x00000032)	No metadata attribute stores this data. The value returned MUST, however, be one of the values defined in the table in section 2.2.3.10.

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100 (0x00000064)	**Comment** in **NamespaceElement**.
150 (0x00000096)	**SecurityDescriptor** of the **NamespaceElement**.

For a standalone DFS namespace, the server MUST identify a consistent GUID for the specified DFS link or DFS root path. This value MUST conform to the expectations of UUID uniqueness provided by [RFC4122] or [C706], though those specific algorithms are not required. This GUID value MUST be used when responding to calls specifying a *Level* parameter whose corresponding return structure provides the GUID: values of 4, 5, 6, 8, or 9.

The server MUST use the following fields in the DFS metadata for a stand-alone DFS namespace to return the required information, depending on the value of the *Level* parameter.

The server MUST use the following fields in the DFS metadata for a domainv1-based DFS namespace to return the required information, depending on the value of the *Level* parameter.

Value	DFS metadata field
1 (0x00000001)	The **PrefixSize** and **Prefix** fields of DFSRootOrLinkIDBLOB.
2 (0x00000002)	In addition to those for Level 1: the **CommentSize**, **Comment**, and **State** fields of DFSRootOrLinkIDBLOB and the **TargetCount** field of DFSTargetListBLOB.
3 (0x00000003)	In addition to those for Level 2: TargetEntryBLOB.
4 (0x00000004)	In addition to those for Level 3: the **ReferralTTL** field of DFSNamespaceRootBLOB or DFSNamespaceLinkBLOB; the **RootOrLinkGuid** field of DFSRootOrLinkIDBLOB.
5 (0x00000005)	In addition to those for Level 4: the **RootOrLinkGuid** field of DFSRootOrLinkIDBLOB, the **Type** field of DFSRootOrLinkIDBLOB, and the **Size** field of the value stored in the **pKT** attribute of the DFS namespace's object, but excluding TargetEntryBLOB.
6 (0x00000006)	In addition to those for Level 5: TargetEntryBLOB.
7 (0x00000007)	The Value of **pKTGuid** attribute of the DFS namespace's object.
50 (0x00000032)	No metadata attribute stores this data. The value returned MUST, however, be one of the values defined in the table in section 2.2.3.10.
100 (0x00000064)	**CommentSize** and **Comment** in DFSRootOrLinkIDBLOB, and BLOBDataSize of DFSNamespaceLinkBLOB.

Note that for interoperability, all root targets of a namespace SHOULD use the same encoding for this **TargetTimestamp** field, as specified in section 2.3.3.1.1.3.1.

The server MUST use the following fields in the DFS metadata for a domainv2-based DFS namespace to return the required information, depending on the value of the *Level* parameter.

Value	DFS metadata field
1 (0x00000001)	The **msDFS-LinkPathv2** attribute.

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Value	DFS metadata field
2 (0x00000002)	In addition to those for Level 1: msDFS-Commentv2, msDFS-Propertiesv2, and the **TargetCount** field of msDFS-TargetListv2.
3 (0x00000003)	In addition to those for Level 2: **msDFS-TargetListv2**.
4 (0x00000004)	In addition to those for Level 3: msDFS-Ttlv2, msDFS-NamespaceIdentityGUIDv2 for DFS root, and msDFS-LinkIdentityGUIDv2 for DFS link.
5 (0x00000005)	In addition to those for Level 4: msDFS-Propertiesv2. Excludes msDFS-TargetListv2.
6 (0x00000006)	In addition to those for Level 4: msDFS-Propertiesv2.
7 (0x00000007)	The value of the **msDFS-GenerationGUIDv2** attribute of the DFS namespace's object.
8 (0x00000008)	In addition to those for Level 5: msDFS-LinkSecurityDescriptorv2.
9 (0x00000009)	In addition to those for Level 6: msDFS-LinkSecurityDescriptorv2.
50 (0x00000032)	The **msDFS-SchemaMajorVersion** and **msDFS-SchemaMinorVersion** attributes.
100 (0x00000064)	The **msDFS-Commentv2** attribute.
150 (0x00000096)	The **msDFS-LinkSecurityDescriptorv2** attribute.

3.1.4.1.7 NetrDfsEnum (Opnum 5)

The NetrDfsEnum method enumerates the DFS root hosted on a server or the DFS links of the namespace hosted by a server. Depending on the information level, the targets of the root and links are also displayed.

The NetrDfsEnum method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsEnum(
  [in] DWORD Level,
  [in] DWORD PrefMaxLen,
  [in, out, unique] DFS_INFO_ENUM_STRUCT* DfsEnum,
  [in, out, unique] DWORD* ResumeHandle
);
```

Level: This parameter specifies the information level of the data and, in turn, determines the action that the method performs. On successful return, the server MUST return an array of the corresponding structures in the buffer pointed to by *DfsEnum*.

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Value	Meaning
Level_1 0x00000001	Gets the name of the DFS root and all links beneath it. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_1 structures.
Level_2 0x00000002	Gets the name, comment, state, and number of targets for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_2 structures.
Level_3 0x00000003	Gets the name, comment, state, number of targets, and target information for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_3 structures.
Level_4 0x00000004	Gets the name, comment, state, time-out, GUID, number of targets, and target information for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_4 structures.
Level_5 0x00000005	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets for a DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_5 structures.
Level_6 0x00000006	Gets the name, comment, state, time-out, GUID, property flags, metadata size, number of targets, and target information for a DFS root or DFS links. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_6 structures.
Level_8 0x00000008	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets for a DFS root and all DFS links under the root. Also returns the security descriptor associated with each of the DFS links. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_8 structures.
Level_9 0x00000009	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets, and target information for a DFS root and all DFS links under the root. Also returns the security descriptor associated with each of the DFS links. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_9 structures.

The server MUST support **Level** values 1, 2 and 3. The server SHOULD support Level values 5, 6, 8, 9, and 300. The server on a DC SHOULD support Level value 200. If the server does not support the provided **Level**, it MUST fail the call.<62> The server SHOULD return error code ERROR_INVALID_PARAMETER for unsupported Level values.<63>

PrefMaxLen: This parameter specifies restrictions on the number of elements returned. A value of 0xFFFFFFFF means there are no restrictions, in which case all entries MUST be returned.<64>

DfsEnum: A pointer to a DFS_INFO_ENUM_STRUCT union to receive the returned information. The client SHOULD set the **Level** member to the same value as the method's *Level* parameter, and MUST set the **DfsInfoContainer** union member to a pointer to the corresponding container structure as specified in section 2.2.6. The client MUST initialize the container structure's **EntriesRead** member to zero and **Buffer** member to a NULL pointer. The value of the **Level** member determines the case of the union.

ResumeHandle: This parameter is used to continue an enumeration when more data is available than can be returned in a single invocation of this method.

- If this parameter is not a NULL pointer, and the method returns ERROR_SUCCESS, this parameter receives an implementation-specific nonzero value that can be passed in subsequent calls to this method to continue the enumeration.
- If this parameter is a NULL pointer or points to a 0 value, it indicates that this is an initial enumeration request.
- If this parameter is not a NULL pointer and points to a nonzero value returned in *ResumeHandle* by an earlier invocation of this method, the server will attempt to continue a

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previous enumeration, but MAY produce incomplete or inconsistent results due to the possibility of concurrent updates to the DFS namespace.<65>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000103 ERROR_NO_MORE_ITEMS	There is no data to return.
0x00000490 ERROR_NOT_FOUND	The specified DFS root namespace does not exist.
0x000010DF ERROR_DEVICE_NOT_AVAILABLE	The server hosts more than one root.

A server MAY<66> implement this method.

The server MUST verify that it hosts a DFS namespace. If that check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST return ERROR_NO_MORE_ITEMS (0x00000103) if there is no data to return.

The server MUST return ERROR_DEVICE_NOT_AVAILABLE if the server hosts more than one root.

Each member of the DFS_INFO_ENUM_STRUCT return buffer MUST be constructed according to the rules of section 3.1.4.1.6 (NetrDfsGetInfo) for the specified value of the *Level* parameter.<67>

If the requested *Level* is 1 through 9 and *ResumeHandle* indicates initial enumeration, the server MUST return the DFS root entry as the first member of the DFS_INFO_ENUM_STRUCT return buffer followed by DFS links in implementation-specific order.

If the requested *Level* is 1 through 9 and *ResumeHandle* does not indicate initial enumeration, the server MUST NOT return the DFS root entry and all the entries of the DFS_INFO_ENUM_STRUCT return buffer MUST be DFS links in implementation-specific order.

3.1.4.1.8 NetrDfsMove (Opnum 6)

The NetrDfsMove (Opnum 6) method renames or moves a DFS link. This method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsMove(
  [in, string] WCHAR* DfsEntryPath,
  [in, string] WCHAR* NewDfsEntryPath,
  [in] unsigned long Flags
);
```

DfsEntryPath: The pointer to a DFS path, this parameter specifies the source path for the move operation. This MUST be a DFS link or the path prefix of any DFS link in the DFS namespace.

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NewDfsEntryPath: The pointer to a DFS path, this parameter specifies the destination DFS path for the move operation. This MUST be a path or a DFS link in the same DFS namespace.

Flags: A bit field specifying additional actions to take.

Value	Meaning
DFS_MOVE_FLAG_REPLACE_IF_EXISTS 0x00000001	If the destination path is an existing link, replace it as part of the move operation.

All other bits are reserved and MUST NOT be used. If reserved bits are specified, the server SHOULD fail the call with ERROR_INVALID_PARAMETER (0x00000057) .

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000032 ERROR_NOT_SUPPORTED	The specified operation is not supported.
0x00000050 ERROR_FILE_EXISTS	The destination path specifies an existing link.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	A specified DFS root namespace does not exist, or no links were matched.

The server MUST verify the existence of the DFS namespaces that the *DfsEntryPath* and *NewDfsEntryPath* parameters specify. If the existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST validate that the source and destination paths are

1. In the same DFS namespace.

2. Below the root of the namespace.

Otherwise, the server MUST return ERROR_NOT_SUPPORTED.

The server MUST return ERROR_NOT_FOUND if the *DfsEntryPath* parameter does not match any DFS links in the namespace, as specified below.

The server MUST validate that the source and destination paths do not specify illegal characters or path elements. If either path is illegal, the server MUST return ERROR_INVALID_NAME.<68>

The server SHOULD perform DFS link move operations atomically. That is, either all of the constituent operations are performed as part of the move and the call succeeds, or no changes are made to the DFS namespace and the call fails.<69>

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When the source and destination are both paths in the DFS namespace and not links themselves, all DFS links in the DFS namespace that have the source path as their prefix MUST be converted to DFS links with the destination path as the prefix. In effect, each DFS link that has the prefix specified by the source path is removed, and new DFS links that have exactly the same targets and target properties are added, but with the prefix specified by the destination path. For example, with a source path of "\\MyServer\MyDfs\dir1" and a destination path of "\\MyServer\MyDfs\dir2", the DFS link "\\MyServer\MyDfs\dir1\link1" becomes "\\MyServer\MyDfs\dir2\link1", while the DFS link "\\MyServer\MyDfs\link2" is unaffected by the move operation.

If a DFS link already exists at the destination path, unless the *Flags* parameter is DFS_MOVE_FLAG_REPLACE_IF_EXISTS, the server MUST fail the call with ERROR_FILE_EXISTS. This MUST be enforced only if the destination is an existing link, not if the destination is an existing file or directory. In the preceding example, if a DFS link "\\MyServer\MyDfs\dir2\link1" already exists, the move operation will fail unless the DFS_MOVE_FLAG_REPLACE_IF_EXISTS flags parameter is specified. If the DFS_MOVE_FLAG_REPLACE_IF_EXISTS flags parameter is specified, the DFS link at the destination path is removed and replaced by the moved DFS link. If "\\MySever\MyDfs\dir2\link1" is an existing directory and not a link, the operation does not require the DFS_MOVE_FLAG_REPLACE_IF_EXISTS flags parameter to be specified.

DFS servers SHOULD support the case in which intermediate or leaf pathname components in the destination path are files. For example, a server should support the case of a source path being "\\MyServer\MyDfs\dir1\link1", a destination path being "\\MyServer\MyDfs\comp1\link1", and "\\MyServer\MyDfs\comp1" being a file.<70>

If intermediate directories in the pathname of a source DFS link are empty, they SHOULD be removed, as required, after a move operation. For example, if "\\MyServer\MyDfs\dir1\dir2\link1" is moved to "\\MyServer\MyDfs\link1", the dir1 and dir2 directories are removed if they are empty.<71>

If the move operation results in a source DFS link becoming the prefix of an existing destination DFS link, the move operation MUST be failed. For example, if the source is a DFS link "\\MyServer\MyDfs\dir1\link1", the destination DFS link specified is "\\MyServer\MyDfs\dir2", and if a DFS link "\\MyServer\MyDfs\dir2\link2" already exists, the server MUST fail the call with ERROR_FILE_EXISTS.

For a domainv1-based DFS namespace and stand-alone DFS namespaces, the link's identity is changed. Thus, to another DFS root target of the same domainv1-based DFS namespace, one link is deleted and then another link is created instead of an existing link being moved.

The server MUST synchronously update the following fields in the DFS metadata for a stand-alone DFS namespace.

Operation	DFS metadata changes required
Remove link	Remove **NamespaceElement** from **NamespaceElementsList**.
Add link	Add **NamespaceElement** in **NamespaceElementsList**.

The server MUST update the following fields in the DFS metadata for a domainv1-based DFS namespace.

Operation	DFS metadata changes required
Remove link	Remove DFSNamespaceLinkBLOB and update BLOBElementCount.
Add link	Add DFSNamespaceLinkBLOB and update BLOBElementCount.

In contrast, for a domainv2-based DFS namespace, the link's identity is not changed. Instead, the **msDFS-LinkPathv2**, **msDFS-LastModifiedv2**, and **msDFS-GenerationGUIDv2** attributes of a DFS link's LDAP entry are updated during a move operation. When a destination link is deleted, the

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required local state changes (on-disk, in-memory) are performed on the DFS root target server performing the move operation as well.

The server MUST update the following fields in the DFS metadata for a domainv2-based DFS namespace.

Operation	DFS metadata changes required
Remove link	Update **msDFS-LinkPathv2**, **msDFS-LastModifiedv2**, and **msDFS-GenerationGUIDv2**.
Add link	Update **msDFS-LinkPathv2**, **msDFS-LastModifiedv2**, and **msDFS-GenerationGUIDv2**.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the *Level* parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.<72>

The move operation on a stand-alone DFS namespace or a domainv2-based DFS namespace also correctly applies to any security descriptor that is associated with the DFS link, to the new reparse point created after the move operation.

3.1.4.1.9 NetrDfsAddRootTarget (Opnum 23)

The NetrDfsAddRootTarget method is used to create a stand-alone DFS namespace, a domainv1-based DFS namespace, or a domainv2-based DFS namespace.<73>

The NetrDfsAddRootTarget method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsAddRootTarget(
  [in, unique, string] LPWSTR DfsPath,
  [in, unique, string] LPWSTR TargetPath,
  [in] ULONG MajorVersion,
  [in, unique, string] LPWSTR Comment,
  [in] BOOLEAN NewNamespace,
  [in] ULONG Flags
);
```

DfsPath: The pointer to a null-terminated Unicode string. This MUST be `\\<domain>\<dfsname>` for domain-based DFS or `\\<server>\<share>` for stand-alone DFS.

TargetPath: The pointer to a null-terminated Unicode string. This MUST be `\\<server>\<share>[\<path>]` for domain-based DFS or NULL for stand-alone DFS. The latter restriction is required to ensure that a typographic error in the domain name, while attempting to create a domain-based DFS, does not result in a stand-alone DFS namespace being created on the DFS root target server, if the first pathname component of the *DfsPath* parameter is used to detect whether a domain-based DFS namespace or stand-alone DFS namespace is being created. When *TargetPath* is not NULL, the <server> MUST be used as the host name of the new DFS root target in the metadata.

MajorVersion: The DFS metadata version to use to create the DFS namespace. When adding a DFS root target to an existing DFS namespace, *MajorVersion* MUST be either 0 or the major version number of the existing DFS namespace. Otherwise, the call MUST fail.

Comment: The pointer to a null-terminated Unicode string that contains a comment associated with this root or link. This string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality. The comment MUST be ignored when adding a target to an existing link.

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NewNamespace: A Boolean value that, if TRUE, indicates a request to create a new root. If FALSE, this value indicates a request to add a new root target to an existing root.

Flags: This parameter MUST be zero for a domain-based DFS namespace and MUST be ignored for a stand-alone DFS namespace.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x000000B7 ERROR_ALREADY_EXISTS	The specified namespace already exists on this server.
0x00000906 NERR_NetNameNotFound	The share that the TargetPath parameter specifies does not already exist.

The following table summarizes the various actions that the NetrDfsAddRootTarget method takes based on the parameter values.

pDfsPath parameter	pTargetPath parameter	MajorVersion parameter	Explanation
\\<domain>\<dfsname>	\\<server>\<share>	1	Creates a new domainv1-based DFS namespace or adds a new root target to an existing domainv1-based DFS namespace. If a DFS namespace already exists, the version specified MUST match the DFS namespace; otherwise, the call fails.
\\<domain>\<dfsname>	\\<server>\<share>	2	Creates a new domainv2-based DFS namespace or adds a new root target to an existing domainv2-based DFS namespace. If a DFS namespace already exists, the version specified MUST match the DFS namespace; otherwise, the call fails.
\\<domain>\<dfsname>	\\<server>\<share>	0	Adds a new root target to an existing domain-based DFS namespace or a domainv2-based DFS namespace. If a DFS namespace does not already exist, the call fails.
\\<server>\<share>	NULL	1	Creates a new stand-alone DFS namespace.

The following scheme is used to create a new domainv2-based DFS namespace:

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- NetrDfsGetSupportedNamespaceVersion is called to determine an appropriate version number to pass to the NetrDfsAddRootTarget() method.
- The client-side method creates a DFS metadata, format-independent LDAP entry called the DFS namespace anchor. It contains only the DFS metadata major version number.
- Updates the **access control list (ACL)** on the object of the DFS namespace to permit read/write access by the DFS root target server.
- The client-side method then issues an RPC call to the DFS root target server.
- The DFS server creates a new DFS namespace LDAP entry with the DFS namespace anchor LDAP entry as its parent.
- All DFS links are created with the DFS namespace LDAP entry as the parent. For more information, see section 2.3.2.

This results in two LDAP entries in domainv2 corresponding to the single LDAP entry in domainv1.

If the domain-based DFS namespace already exists, and the *ServerName* and **RootShare** parameters are a root target, the server MUST fail with ERROR_ALREADY_EXISTS.

If the share that the *TargetPath* parameter specifies does not already exist, the RPC method MUST fail with NERR_NetNameNotFound (0x00000906).

The server MUST synchronously update the following fields in the stand-alone DFS metadata.

Operation	DFS metadata changes required.
Adding a new namespace	Creates a new **Namespace** object for the namespace, and inserts the object into **NamespaceList**.

The server MUST update the following fields in the domainv1-based DFS metadata.

Operation	DFS metadata changes required
Adding a new namespace	Creates new DFS metadata.
Adding a new root target	Updates the TargetCount field of the DFSTargetListBLOB, creates a new TargetEntryBLOB, updates the DFSTargetListBLOBSize, updates the BLOBDataSize of the DFSNamespaceRootBLOB, and adds the DFSRootTarget to the remoteServerName attribute in the object.

The server MUST update the following fields in the domainv2-based DFS metadata.

Operation	DFS metadata changes required
Adding a new namespace	Creates new DFS namespace LDAP entry with the DFS namespace anchor LDAP as its parent.
Adding a new root target	Updates the msDFS-TargetListv2 attribute, which is stored as an XML document, by adding *server* into the list of root targets.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the Level parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.

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3.1.4.1.10 NetrDfsRemoveRootTarget (Opnum 24)

The NetrDfsRemoveRootTarget (Opnum 24) method is the unified DFS namespace deletion method. It deletes stand-alone DFS namespaces, domainv1-based DFS namespaces, or domainv2-based DFS namespaces based on parameters specified.<74>

The NetrDfsRemoveRootTarget (Opnum 24) method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsRemoveRootTarget(
  [in, unique, string] LPWSTR pDfsPath,
  [in, unique, string] LPWSTR pTargetPath,
  [in] ULONG Flags
);
```

pDfsPath: The pointer to a null-terminated Unicode string. This MUST be `\\<domain>\<dfsname>` for domain-based DFS or `\\<server>\<share>` for stand-alone DFS.

pTargetPath: The pointer to a null-terminated Unicode string. This MUST be `\\<server>\<share>[\<path>]` for domain-based DFS or NULL for stand-alone DFS.

Flags: A bit field specifying the type of removal operation. For a standalone namespace, this bit-field parameter MUST be zero. For a domain-based DFS namespace, it can be zero or the following value. Zero indicates a normal removal operation.

Value	Meaning
DFS_FORCE_REMOVE 0x80000000	Specifying this flag for a domain-based DFS namespace removes the root target even if it is not accessible.

All other bits are reserved and MUST NOT be used. If reserved bits are specified, the server SHOULD fail the call with an implementation-dependent failure value.<75>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000002 ERROR_FILE_NOT_FOUND	The specified DFS root target was not found as a target of the specified DFS namespace.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS root namespace does not exist.

The server MUST verify the existence of the DFS namespace that the *pDfsPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

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The server MUST verify the existence of the DFS root target of the DFS namespace that the *pTargetPath* parameter specifies. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

The server MUST support deleting a DFS namespace without first requiring removal of all the DFS links in it.

The client-side method is responsible for deleting the DFS namespace anchor LDAP entry corresponding to a domainv2-based DFS namespace.

The server MAY support DFS_FORCE_REMOVE on **member servers**.<76> If it is not supported and DFS_FORCE_REMOVE is specified, the server MUST return a failure.

If DFS_FORCE_REMOVE is not specified and it is a domain-based DFS namespace, the server MUST verify it is the host specified by the *pTargetPath* parameter. If it is not, the server MUST return ERROR_FILE_NOT_FOUND.

If DFS_FORCE_REMOVE is not specified, the server SHOULD<77> also remove any local information related to hosting the removed root target. If DFS_FORCE_REMOVE is specified, the server MUST NOT do so.

The effect of DFS_FORCE_REMOVE is to clean up after the named root target has become nonfunctional and is unable to remove itself from the namespace.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

The server SHOULD remove any intermediate directories and reparse points that were part of the namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the Level parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.

The following table summarizes the various actions that the NetrDfsRemoveRootTarget method takes based on the parameter values.

pDfsPath parameter	pTargetPath parameter	Explanation
\\<domain>\<dfsname>	\\<server>\<share>	Deletes a domain-based DFS root target. If the DFS root target that is removed is the last one for the DFS namespace, then it removes the DFS namespace itself. This parameter can be used for either a domainv1-based DFS namespace or a domainv2-based DFS namespace.
\\<server>\<dfsname>	NULL	Deletes a stand-alone DFS namespace.

3.1.4.1.11 NetrDfsGetSupportedNamespaceVersion (Opnum 25)

The NetrDfsGetSupportedNamespaceVersion (Opnum 25) method is used to determine the supported DFS metadata version number.<78>

The NetrDfsGetSupportedNamespaceVersion (Opnum 25) method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsGetSupportedNamespaceVersion(
  [in] DFS_NAMESPACE_VERSION_ORIGIN Origin,
```


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```
    [in, unique, string] NETDFS_SERVER_OR_DOMAIN_HANDLE pName,
    [out] PDFS_SUPPORTED_NAMESPACE_VERSION_INFO pVersionInfo
);
```

Origin: This parameter specifies the version information requested.

Value	Meaning
DFS_NAMESPACE_VERSION_ORIGIN_SERVER 0x0001	This specifies that the returned information MUST reflect the metadata versions supported by the server. Versions supported by the server may be higher (or lower) than those supported by the domain.
DFS_NAMESPACE_VERSION_ORIGIN_DOMAIN 0x0002	This specifies that the returned information MUST reflect the metadata versions supported by the domain schema of the domain to which the server is joined. Versions supported by the domain schema may be higher (or lower) than those supported by the server.

pName: The pointer to a null-terminated Unicode string. The server MUST ignore the *pName* parameter.

pVersionInfo: The pointer to a DFS_SUPPORTED_NAMESPACE_VERSION_INFO structure to receive the DFS metadata version number determined.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.

The standalone namespace version supported by a server may be unaffected by the domain metadata schema. If this is the case, the server MUST return a standalone DFS major and minor version of zero for the DFS_NAMESPACE_VERSION_ORIGIN_DOMAIN query. In this case, the standalone DFS capability field has no meaning and MUST also be zero.

The version number of the DFS metadata that can be used for a new DFS namespace depends on the following:

- For domain-based DFS namespaces, the version supported by the DFS metadata schema in use in the server's domain.
- The version supported by the server that is to host the DFS root target.

Thus, the version that can be used for creating a new DFS namespace is the minimum version that the domain and the server support.

This method is useful in determining an appropriate version number to pass to the NetrDfsAddRootTarget method.

3.1.4.2 Extended Methods

3.1.4.2.1 NetrDfsAdd2 (Opnum 19)

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The NetrDfsAdd2 (Opnum 19) method creates a new DFS link or adds a new target to an existing link of a DFS namespace.

The NetrDfsAdd2 method has the following MIDL syntax.

```
NET_API_STATUS NetrDfsAdd2(
  [in, string] WCHAR* DfsEntryPath,
  [in, string] WCHAR* DcName,
  [in, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in, unique, string] WCHAR* Comment,
  [in] DWORD Flags,
  [in, out, unique] DFSM_ROOT_LIST** ppRootList
);
```

DfsEntryPath: A pointer to a DFS link path that contains the name of an existing link when additional link targets are added or the name of a new link is created.

DcName: A pointer to a null-terminated Unicode string. For a domain-based DFS namespace, this is the host name of the DC that the DFS root target uses to get or update DFS metadata for the DFS namespace. This parameter MAY be a NULL pointer; otherwise, it MUST be the host name of the PDC for the domain of the DFS namespace.<79>

ServerName: A pointer to a null-terminated Unicode string that specifies the DFS link target host name.

ShareName: A pointer to a null-terminated Unicode DFS link target share name string. This may also be a share name with a path relative to the share (for example, `share1\mydir1\mydir2`). When specified in this manner, each pathname component MUST be a directory.

Comment: A pointer to a null-terminated, human-readable Unicode string description associated with this root or link. This string is not subject to protocol-specified restrictions on length or content and does not affect server functionality. The description MUST be ignored when adding a target to an existing link.

Flags: The flag that indicates the operation to perform. The following table lists the possible values.

Value	Meaning
0x00000000	Create a new link or add a new target to an existing link.
DFS_ADD_VOLUME 0x00000001	Create a new link in the DFS namespace if one does not already exist or fail if it exists.
DFS_RESTORE_VOLUME 0x00000002	Add a target without verifying its existence.

If the *Flags* value is not a bitwise OR of the values above, the server MUST return ERROR_INVALID_PARAMETER (0x00000057).

ppRootList: On success, returns a list of DFS root targets in the domain-based DFS namespace that the client will be responsible for notifying of the change in the DFS namespace. See section 3.2.4.2.1. This list MAY be empty if the server performs the notification.<80>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

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Return value/code	Description
0x00000000 ERROR_SUCCESS	The operation completed successfully.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000050 ERROR_FILE_EXISTS	The specified DFS link target already exists.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS namespace does not exist.
0x00000906 NERR_NetNameNotFound	The DFS link target does not exist.

A server MAY<81> implement this method.

If the NetrDfsAdd (Opnum 1) method on a server does not support a domain-based namespace, the server SHOULD support a domain-based namespace in the NetrDfsAdd2 (Opnum 19) method. <82><83>

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify whether the link to be added overlaps an existing link. If there is a link for which the specified DfsEntryPath parameter is a prefix, the server MUST return ERROR_FILE_EXISTS.

If the link to be added already exists, and DFS_ADD_VOLUME is set in the **Flags** field of the request, the server MUST return ERROR_FILE_EXISTS.

If the link to be added already exists, and DFS_ADD_VOLUME is not set in the **Flags** field of the request, the server MUST attempt to add a new link target to the link. If a target with the path specified by *ServerName* and *ShareName* was already added to the link, the server MUST return ERROR_FILE_EXISTS.

If DFS_RESTORE_VOLUME is not specified on the Flags parameter, the server MAY<84> choose to verify whether the link target exists. If DFS_RESTORE_VOLUME is specified, the server MUST NOT perform this test. If it performs the test and the link target does not exist, the server MUST fail the call with NERR_NetNameNotFound.

The exact test the server performs to verify link target existence is implementation-defined. A server MAY,<85> for example, be implemented with the expectation that all link targets are administered through [MS-SRVS] section 3.1.4.10 and use NetShareGetInfo level 1005 to perform the test. Reasons not to implement this test include:

- It may not be practical to determine the correct administration interface to query to perform the test.
- A link target server may export a share with a network protocol and administration interface that this server does not understand.
- A secured link target server may not permit this server to contact it.

The *Comment* parameter MUST be ignored when adding a target to an existing link.

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The server SHOULD<86> create a new link without requiring the DFS_ADD_VOLUME *Flags* parameter.

The server MUST update the same fields in the DFS metadata for a domain-based DFS namespace as in the NetrDfsAdd method, as specified in section 3.1.4.1.3.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST do one of the following:

- Notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo method with the *Level* parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE. The returned *ppRootList* parameter MUST be empty.
- Perform no notification of the other root targets, returning a list of DFS root targets to the client in the *ppRootList* parameter.

3.1.4.2.2 NetrDfsRemove2 (Opnum 20)

The NetrDfsRemove2 (Opnum 20) method removes the specified link or link target.

The NetrDfsRemove2 method uses the following MIDL syntax.

```
NET API STATUS NetrDfsRemove2(
  [in, string] WCHAR* DfsEntryPath,
  [in, string] WCHAR* DcName,
  [in, unique, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in, out, unique] DFSM ROOT LIST** ppRootList
);
```

DfsEntryPath: The pointer to a DFS link path that contains the name of the DFS link to remove.

DcName: The pointer to a null-terminated Unicode string. For a domain-based DFS namespace, this string contains the host name of the DC to be used by the DFS root target that is removing the DFS link. This parameter MAY be a NULL pointer; otherwise, it MUST be the PDC for the domain of the DFS namespace.<87>

ServerName: The pointer to a null-terminated Unicode DFS link target host name string. This MUST be a NULL pointer when the link and all of the link targets are to be removed.

ShareName: The pointer to a null-terminated Unicode DFS link target share name string. This MUST be a NULL pointer when the link and all of the link targets are to be removed.

ppRootList: On success, returns a list of DFS root targets in the domain-based DFS namespace that the client will be responsible for notifying of the change in the DFS namespace. See section 3.2.4.2.2. This list MAY be empty if the server has performed the notification.<88>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000002	The specified DFS link target was not found as a target of the specified DFS

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Return value/code	Description
ERROR_FILE_NOT_FOUND	link.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS namespace or DFS link does not exist.

The server MAY<89> implement this method.

If the NetrDfsRemove (Opnum 2) method on a server does not support a domain-based namespace, the server SHOULD support a domain-based namespace in the NetrDfsRemove2 (Opnum 20) method.<90><91>

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link target of the DFS link that the *ServerName* and *RootShare* parameters specify. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

If the *ServerName* and *ShareName* parameters are both NULL, the server MUST remove the link and all its link targets. If the *ServerName* and *ShareName* are not NULL, the server MUST remove the specified link target. If the specific target is the last target of the link, the server MUST remove the link as well. If only one of *ServerName* or *ShareName* is NULL, the server MUST return ERROR_INVALID_PARAMETER.

The server MUST update the same fields in the DFS metadata for a domain-based DFS namespace, as specified in the NetrDfsRemove method.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST do one of the following:

- Notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo method with the *Level* parameter 101, and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE. The returned *ppRootList* parameter MUST be empty.
- Perform no notification of the other root targets, returning a list of DFS root targets to the client in the *ppRootList* parameter.

3.1.4.2.3 NetrDfsEnumEx (Opnum 21)

The NetrDfsEnumEx (Opnum 21) method enumerates the DFS roots hosted on a server, or DFS links of a namespace hosted by the server.<92><93> Depending on the information level, the targets associated with the roots and links are also displayed.

The NetrDfsEnumEx method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsEnumEx(
```


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```
    [in, string] WCHAR* DfsEntryPath,
    [in] DWORD Level,
    [in] DWORD PrefMaxLen,
    [in, out, unique] DFS_INFO_ENUM_STRUCT* DfsEnum,
    [in, out, unique] DWORD* ResumeHandle
);
```

DfsEntryPath: The pointer to a domain name, a host name, or a DFS path, depending on the *Level* parameter.

- A domain name MUST be a null-terminated Unicode string in the following forms:

  ```
  <DomainName> or \<DomainName> or \\<DomainName>
  ```

  where <DomainName> is the domain name to use for the enumeration.

- A host name MUST be a null-terminated Unicode string in the following formats:

  ```
  <ServerName> or \<ServerName> or \\<ServerName>
  ```

  where <ServerName> is a host name.

- A DFS root or a DFS link path.

  When *DfsEntryPath* points to a DFS link path, the remaining path after the DFS namespace name MUST be ignored.

Level: This parameter specifies the information level of the data and in turn determines the action the method performs. On successful return, the server MUST return an array of the corresponding structures in the buffer pointed to by DfsEnum.

Value	Meaning
Level_1 0x00000001	Gets the name of the DFS root and all links beneath it. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_1 structures.
Level_2 0x00000002	Gets the name, comment, state, and number of targets for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_2 structures.
Level_3 0x00000003	Gets the name, comment, state, number of targets, and information about each target for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_3 structures.
Level_4 0x00000004	Gets the name, comment, state, time-out, GUID, number of targets, and information about each target for the DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_4 structures.
Level_5 0x00000005	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets for a DFS root and all links under the root. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_5 structures.
Level_6 0x00000006	Gets the name, comment, state, time-out, GUID, property flags, metadata size, number of targets, and target information for a root or link. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_6 structures.

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Value	Meaning
Level_8 0x00000008	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets for a DFS root and all links under the root. Also returns the security descriptor associated with each of the DFS links. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_8 structures.
Level_9 0x00000009	Gets the name, comment, state, time-out, GUID, property flags, metadata size, and number of targets and target information for a DFS root and all links under the root. Also returns the security descriptor associated with each of the DFS links. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_9 structures.
Level_200 0x000000C8	Enumerates all of the domain-based DFS namespace in the specified domain. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_200 structures.
Level_300 0x0000012C	Enumerates the stand-alone and domain-based DFS roots that the server hosts. In this case, on successful return DfsEnum MUST point to an array of DFS_INFO_300 structures.

The server MUST support Level values 1, 2 and 3. The server SHOULD support Level values 5, 6, 8, 9, and 300. The server on a DC SHOULD support Level value 200.<94> If the server does not support the provided Level, it MUST fail the call. The server SHOULD return error code ERROR_INVALID_PARAMETER for unsupported Level values.<95>

PrefMaxLen: This parameter specifies restrictions on the number of elements returned. A value of 0xFFFFFFFF means there are no restrictions, in which case all entries MUST be returned.<96>

DfsEnum: A pointer to a DFS_INFO_ENUM_STRUCT union to receive the returned information. The client SHOULD set the **Level** member to the same value as the method's *Level* parameter, and MUST set the **DfsInfoContainer** union member to a pointer to the corresponding container structure as specified in section 2.2.6. The client MUST initialize the container structure's **EntriesRead** member to zero and the **Buffer** member to a NULL pointer. The value of the **Level** member determines the case of the union.

ResumeHandle: This parameter is used to continue an enumeration when more data is available than can be returned in a single invocation of this method.

- If this parameter is not a NULL pointer, and the method returns ERROR_SUCCESS, this parameter receives an implementation-specific nonzero value that can be passed in subsequent calls to this method to continue the enumeration.
- If this parameter is a NULL pointer, or it points to a zero value, it indicates that this is an initial enumeration.
- If this parameter is not a NULL pointer, and it points to a nonzero value returned in *ResumeHandle* by an earlier invocation of this method, the server will attempt to continue a previous enumeration.<97>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF], section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000103	There is no data to return.

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Return value/code	Description
ERROR_NO_MORE_ITEMS	
0x00000490 ERROR_NOT_FOUND	The specified DFS root namespace does not exist.

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST return ERROR_NO_MORE_ITEMS (0x00000103) if there is no data to return.

Unlike the NetrDfsEnum method, this method can be used even when the server is hosting more than one DFS root.

If the server hosts exactly one DFS namespace, the requested Level is 1 through 9, and the DfsEntryPath does not specify a DFS namespace name, the server MAY enumerate the namespace it hosts.<98>

Each member of the DFS_INFO_ENUM_STRUCT return buffer MUST be constructed according to the rules of section 3.1.4.1.6 (NetrDfsGetInfo) for the specified value of the *Level* parameter.

If the requested *Level* is 1 through 9 and *ResumeHandle* indicates initial enumeration, the server MUST return the DFS root entry as the first member of the DFS_INFO_ENUM_STRUCT return buffer followed by DFS links in implementation-specific order.

If the requested *Level* is 1 through 9 and *ResumeHandle* does not indicate initial enumeration, the server MUST NOT return the DFS root entry and all the entries of the DFS_INFO_ENUM_STRUCT return buffer MUST be DFS links in implementation-specific order.

3.1.4.2.4 NetrDfsSetInfo2 (Opnum 22)

The NetrDfsSetInfo2 (Opnum 22) method sets or modifies the information associated with a DFS root, a DFS root target, a DFS link, or a DFS link target.

The NetrDfsSetInfo2 method has the following MIDL syntax.

```
NET API STATUS NetrDfsSetInfo2(
  [in, string] WCHAR* DfsEntryPath,
  [in, string] WCHAR* DcName,
  [in, unique, string] WCHAR* ServerName,
  [in, unique, string] WCHAR* ShareName,
  [in] DWORD Level,
  [in, switch is(Level)] DFS INFO STRUCT* pDfsInfo,
  [in, out, unique] DFSM_ROOT_LIST** ppRootList
);
```

DfsEntryPath: The pointer to a DFS root path or a DFS link path that contains the name of a DFS root or DFS link name.

DcName: The pointer to a null-terminated Unicode string. It MUST be ignored for a stand-alone DFS namespace. For a domain-based DFS namespace, this string contains the host name of the DC that the DFS root target uses to get or update DFS metadata for the DFS namespace. This parameter MAY be a NULL pointer; otherwise, it MUST be the PDC for the domain of the DFS namespace.<99>

ServerName: The pointer to a null-terminated Unicode DFS root target or a DFS link target host name string. This parameter MUST be a NULL pointer if the operation is intended for a DFS root or a DFS link and not for targets.

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ShareName: The pointer to a null-terminated Unicode DFS root target or a DFS link target share name string. This parameter MUST be a NULL pointer if the operation is intended for a DFS root or a DFS link and not for targets.

Level: This parameter specifies the information level of the data and, in turn, determines the action the method performs.

Value	Meaning
Level_100 0x00000064	Sets the comment associated with the root or link that specified in *DfsInfo*.
Level_101 0x00000065	Sets the storage state associated with the root, link, root target, or link target specified in *DfsInfo*.<100>
Level_102 0x00000066	Sets the time-out value associated with the root or link specified in *DfsInfo*.
Level_103 0x00000067	Sets the property flags for the root or link specified in *DfsInfo*.
Level_104 0x00000068	Sets the target priority rank and class for the root target or link target specified in *DfsInfo*.
Level_105 0x00000069	Sets the comment, state, time-out information, and property flags for the root or link specified in *DfsInfo*. This does not apply to a root target or link target.
Level_106 0x0000006A	Sets the target state and priority for the root target or link target specified in *DfsInfo*. This does not apply to the DFS namespace root or link.<101>
Level_107 0x0000006B	Sets the comment, state, time-out, security descriptor information, and property flags for the root or link specified in *DfsInfo*. Does not apply to a root target or link target. The *ServerName* and *ShareName* parameters MUST be NULL. The security descriptor MUST NOT have an owner, group, or SACLs in it. The security descriptor MUST be a NULL, zero length value if used on a namespace root. In this case, note that it is equivalent to using Level_105.
Level_150 0x00000096	Sets the security descriptor associated with a link. Only stand-alone DFS namespaces and domainv2-based DFS namespaces are supported. The *ServerName* and *ShareName* parameters MUST both be NULL. The security descriptor MUST NOT have an owner, group, or SACLs in it.

The server MUST support Level values 100 and 101. The server SHOULD support Level values 102-107 and 150. If the server does not support the provided Level, it MUST fail the call.<102> The server SHOULD return error code ERROR_INVALID_PARAMETER for unsupported Level values.<103>

pDfsInfo: The pointer to a DFS_INFO_STRUCT union that contains the specified data. The *Level* parameter value determines the case of the union.

ppRootList: On success, returns a list of DFS root targets in the domain-based DFS namespace which the client will be responsible for notifying about the change in the DFS namespace. See section 3.2.4.2.3. This list MAY be empty if the server has performed the notification.<104>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

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Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000002 ERROR_FILE_NOT_FOUND	The specified DFS link target was not found as a target of the specified DFS link.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000032 ERROR_NOT_SUPPORTED	The specified operation is not supported.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS root, DFS link, or DFS link or root target does not exist.

The server MAY<105> implement this method.

If the NetrDfsSetInfo (Opnum 3) method on a server does not support a domain-based namespace, the server SHOULD support a domain-based namespace in the NetrDfsSetInfo2 (Opnum 22) method.<106><107>

The server MUST verify the existence of the DFS namespace that the *DfsEntryPath* parameter specifies. If the namespace does not exist, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link that the *DfsEntryPath* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS link target of the DFS link that the *ServerName* and *RootShare* parameters specify. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

If the *DcName* parameter is not NULL, it MUST be the PDC for the domain of the domain-based DFS namespace.

The server MUST fail any attempt to set the state of a DFS root, a DFS link, a DFS root target, or a DFS link target to a value that is not specified. The server MUST fail any attempt to set the property flags on a DFS link that are defined only for a DFS root.

With the *Level* parameter 101 and the **State** field in the DFS_INFO_101 structure as DFS_VOLUME_STATE_RESYNCHRONIZE, the server MUST reload the contents of the DFSMetadataCache, if maintained, for the domain-based DFS namespace that the *ShareName* parameter specifies. In the case of both domain-based DFS namespaces and stand-alone DFS namespaces, the server MUST check the DFS namespace it hosts locally with the DFS metadata and perform any required modifications.

With the *Level* parameter 101 and the **State** field in the DFS_INFO_101 structure as DFS_VOLUME_STATE_FORCE_SYNC, the server MUST perform a full synchronization instead of an incremental synchronization to reload the contents of the DFSMetadataCache and to identify added or deleted DFS links. This **State** field is supported on domainv2-based DFS namespaces and stand-alone DFS namespaces.

When *level* parameter 107 is used for a DFS namespace root or for a domainv1-based DFS link, the *pSecurityDescriptor* parameter has no meaning because security descriptors cannot be associated with

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those objects. In these cases, if pSecurityDescriptor is not NULL, the server MUST fail with ERROR_NOT_SUPPORTED.

The server MUST update the same fields in the DFS metadata for a domain-basedv1 DFS namespace as for the NetrDfsSetInfo (Opnum 3) method, as specified in section 3.1.4.1.5.

The server MUST synchronously update the DFS metadata of a domain-based DFS namespace.

If DFS root scalability mode is not enabled for the domain-based DFS namespace, the server MUST do one of the following:

- Notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the *Level* parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE. The returned *ppRootList* parameter MUST be empty.
- Perform no notification of the other root targets, returning a list of DFS root targets to the client in the *ppRootList* parameter.

3.1.4.3 Root Target Methods

3.1.4.3.1 NetrDfsAddFtRoot (Opnum 10)

The NetrDfsAddFtRoot (Opnum 10) method creates a new domainv1-based DFS namespace or adds a root target to an existing namespace.

The NetrDfsAddFtRoot method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsAddFtRoot(
  [in, string] WCHAR* ServerName,
  [in, string] WCHAR* DcName,
  [in, string] WCHAR* RootShare,
  [in, string] WCHAR* FtDfsName,
  [in, string] WCHAR* Comment,
  [in, string] WCHAR* ConfigDN,
  [in] BOOLEAN NewFtDfs,
  [in] DWORD ApiFlags,
  [in, out, unique] DFSM ROOT LIST** ppRootList
);
```

ServerName: The pointer to a null-terminated Unicode string. This MUST be used as the host name of the new DFS root target in the metadata.<108>

DcName: The pointer to a null-terminated Unicode string. For a domainv1-based DFS namespace, this string contains the host name of the DC that the new DFS root target is to use to get or update DFS metadata for the DFS namespace. This parameter MAY be a NULL pointer, otherwise, it MUST be the PDC for the domain of the DFS namespace.

RootShare: The pointer to a null-terminated Unicode string. This is the new DFS root target share name. This may be different from the *FtDfsName* parameter. The share MUST already exist.

FtDfsName: The pointer to a null-terminated Unicode string. This is the name of the new or existing domain-based DFS namespace.

Comment: The pointer to a null-terminated Unicode string that contains a comment associated with the DFS namespace. Used for informational purposes, this string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality. This parameter MAY be NULL.

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ConfigDN: The pointer to a null-terminated Unicode string. This string MUST be the path of the DFS namespace object entry in the DFS Configuration Container (see section 2.3.3).<109>

NewFtDfs: A Boolean value that, if TRUE, indicates a request to create a new root. If FALSE, then this value indicates a request to add a new root target to an existing root.

ApiFlags: This parameter MUST be 0.

ppRootList: On success, returns a list of DFS root targets in the domain-based DFS namespace that the client will be responsible for notifying of the change in the DFS namespace. See section 3.2.4.3.1. The list MAY be empty if the server has performed the notification.<110>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x000000B7 ERROR_ALREADY_EXISTS	A namespace of the specified name already exists on the server.
0x00000906 NERR_NetNameNotFound	The share that the RootShare parameter specifies does not already exist.

The share that the *RootShare* parameter specifies MUST already exist on the server.

If the *DcName* parameter is not NULL, the server assumes that this is the PDC for the domain in which the DFS namespace is to be created.

If the domain-based DFS namespace already exists, and the *ServerName* and *RootShare* parameters are a root target, the server MUST fail with ERROR_ALREADY_EXISTS.

If the share that the *RootShare* parameter specifies does not already exist, the RPC method MUST fail with NERR_NetNameNotFound (0x00000906).

The server MUST update the following fields in the domainv1-based DFS metadata.

Operation	DFS metadata changes required
Adding a new namespace	Creates new DFS metadata.
Adding a new root target	Updates the **TargetCount** field of the DFSTargetListBLOB, creates a new TargetEntryBLOB, updates the DFSTargetListBLOBSize, updates the BLOBDataSize of the DFSNamespaceRootBLOB, and adds the DFSRootTarget to the **remoteServerName** attribute in the object.

The server MUST synchronously update the DFS metadata.

The server MUST return a list of DFS root targets to the client in the *ppRootList* parameter.<111>

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3.1.4.3.2 NetrDfsRemoveFtRoot (Opnum 11)

The NetrDfsRemoveFtRoot (Opnum 11) method removes the specified root target from a domainv1-based DFS namespace.<112> If the target is the last one associated with the DFS namespace, then this method also deletes the DFS namespace. The DFS namespace can be removed without first removing all of the links in it.

If a client tries to use this method on a domainv2-based DFS namespace target, then the server MUST fail with the return value of ERROR_NOT_SUPPORTED.

The NetrDfsRemoveFtRoot method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsRemoveFtRoot(
  [in, string] WCHAR* ServerName,
  [in, string] WCHAR* DcName,
  [in, string] WCHAR* RootShare,
  [in, string] WCHAR* FtDfsName,
  [in] DWORD ApiFlags,
  [in, out, unique] DFSM_ROOT_LIST** ppRootList
);
```

ServerName: The pointer to a null-terminated Unicode string. This is the host name DFS root target to be removed.

DcName: The pointer to a null-terminated Unicode string. For a domainv1-based DFS namespace, this string contains the host name of the DC to be used by the DFS root targets being removed for getting or updating DFS metadata for the DFS namespace. This parameter MAY be a NULL pointer; otherwise, it MUST be the PDC for the domain of the DFS namespace.

RootShare: The pointer to a null-terminated Unicode DFS root target share name string. The share is not removed automatically when the method is successful; it MUST be removed explicitly as needed.

FtDfsName: The pointer to a null-terminated Unicode string that contains the DFS namespace in which the operation is to be performed. It MAY be different from the *RootShare*.

ApiFlags: The only supported bit in the *ApiFlags* parameter is DFS_FORCE_REMOVE.

Value	Meaning
DFS_FORCE_REMOVE 0x80000000	Removes the named DFS root target from the namespace's directory service metadata only.

All other bits are reserved and MUST NOT be used. If reserved bits are specified, the server SHOULD<113> fail the call.

ppRootList: On success, returns a list of DFS root targets in the domain-based DFS namespace which the client will be responsible for notifying about the change in the DFS namespace. See section 3.2.4.3.2. The list MAY be empty if the server has performed the notification.<114>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2.The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.

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Return value/code	Description
0x00000002 ERROR_FILE_NOT_FOUND	The specified DFS root target was not found as a target of the specified DFS namespace.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000057 ERROR_INVALID_PARAMETER	An incorrect parameter was specified.
0x00000490 ERROR_NOT_FOUND	The specified DFS rootnamespace does not exist.

The server MUST verify the existence of the DFS namespace that the *FtDfsName* parameter specifies. If that existence check fails, the server MUST return ERROR_NOT_FOUND.

The server MUST verify the existence of the DFS root target of the DFS namespace that the *ServerName* and *RootShare* parameters specify. If that existence check fails, the server MUST return ERROR_FILE_NOT_FOUND.

The server MUST support deleting a DFS namespace without first requiring removal of all the DFS links in it.

If the *DcName* parameter is not NULL, then it MUST be the PDC for the domain of the DFS namespace.

The server MAY support DFS_FORCE_REMOVE on member servers.<115> If it is not supported and DFS_FORCE_REMOVE is specified, the server MUST return a failure.

If DFS_FORCE_REMOVE is not specified, the server MUST verify it is the host specified by the *ServerName* and *RootShare* parameters. If it is not, the server MUST return ERROR_NOT_FOUND.

If DFS_FORCE_REMOVE is not specified, the server SHOULD<116> also remove any local information related to hosting the removed root target. If DFS_FORCE_REMOVE is specified, the server MUST NOT do so.

The effect of DFS_FORCE_REMOVE is to clean up after the named root target has become nonfunctional and is unable to remove itself from the namespace.

The server MUST remove the root target of the domain-based DFS namespace specified by the *ServerName* and *RootShare* parameters by updating the **remoteServerName** attribute of the namespace's object (as specified in section 2.3.3) in the root target. If the last DFS root target is being removed, then the server SHOULD NOT remove the object of the namespace; the client invoking the method MUST do this.<117>

The server SHOULD remove any intermediate directories and reparse points that were part of the namespace.

The server MUST update the following fields in the domainv1-based DFS metadata.

Operation	DFS metadata changes required
Remove a namespace.	Removes the object of DFS namespace.
Remove a root target.	Updates the **TargetCount** in the existing DFSTargetListBLOB, removes the TargetEntryBLOB, updates the DFSTargetListBLOBSize, updates the BLOBDataSize of the DFSNamespaceRootBLOB, and removes the root target from the **remoteServerName** attribute in the object.

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The server MUST synchronously update the DFS metadata of the namespace.

If DFS root scalability mode is not enabled, then the server MUST do one of the following:

- Notify other DFS root targets of the change in DFS metadata by asynchronously issuing a NetrDfsSetInfo (Opnum 3) method with the *Level* parameter 101 and with the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE. The returned *ppRootList* parameter MUST be empty.
- Perform no notification of the other root targets, returning a list of DFS root targets to the client in the *ppRootList* parameter.

3.1.4.3.3 NetrDfsFlushFtTable (Opnum 18)

For information about this method, see 3.3.4.3.2.

3.1.4.4 Stand-Alone Namespace Methods

3.1.4.4.1 NetrDfsAddStdRoot (Opnum 12)

The NetrDfsAddStdRoot (Opnum 12) method creates a new stand-alone DFS namespace.<118><119>

The NetrDfsAddStdRoot method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsAddStdRoot(
  [in, string] WCHAR* ServerName,
  [in, string] WCHAR* RootShare,
  [in, string] WCHAR* Comment,
  [in] DWORD ApiFlags
);
```

ServerName: The pointer to a null-terminated Unicode string. This is the host name of the new DFS root target.

RootShare: The pointer to a null-terminated Unicode string. This is the new DFS root target share name as well as the DFS namespace name. The share MUST already exist.

Comment: The pointer to a null-terminated Unicode string that contains a comment associated with the DFS namespace. Used for informational purposes, this string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality. This parameter MAY be a NULL pointer.

ApiFlags: This parameter is reserved for future use and is ignored by the server.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000050	The DFS namespace that the *ServerName* and *RootShare* parameters specify

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Return value/code	Description
ERROR_FILE_EXISTS	already exists.<120>
0x000000B7 ERROR_ALREADY_EXISTS	The DFS namespace that the *ServerName* and *RootShare* parameters specify already exists.<121>
0x00000906 NERR_NetNameNotFound	The share that the *RootShare* parameter specifies does not already exist.

On receiving this method, the server MUST do the following:

- If there is any entry in the **NamespaceList** with the **NamespaceName** matching *RootShare*, then the RPC method MUST fail with either ERROR_FILE_EXISTS (0x00000050) or ERROR_ALREADY_EXISTS (0x000000B7).
- If the share that the *RootShare* parameter specifies does not already exist, the RPC method MUST fail with NERR_NetNameNotFound (0x00000906).
- Create the **Namespace** object, and insert it into the **NamespaceList**. The **Namespace** object MUST be initialized as follows.
  - **Namespace.NamespaceName** is set to *RootShare*.
  - **Namespace.NamespaceType** is set to stand-alone.
  - **Namespace.GenerationGUID** is set with a GUID.
  - Create a **NamespaceElement** object and insert it into **Namespace.NamespaceElementsList**.
  - **NamespaceElementsList.NamespaceElement** is initialized as follows.
    - **NamespaceElement.Properties** is set to 0.
    - **NamespaceElement.State** is set to DFS_VOLUME_STATE_OK.
    - **NamespaceElement.Comment** is set to **Comment**.
    - **NamespaceElement.ReferralTTL** is set to 300 seconds.
    - **NamespaceElement.SecurityDescriptor** is set to none.
    - Create a **Target** object, insert it into **NamespaceElement.TargetsList** and update **TargetsList.TargetCount** to 1.
    - **TargetsList.Target** object is initialized as follows.
      - **Target.PriorityRank** is set to 0.
      - **Target.PriorityClass** is set to DfsSiteCostNormalPriorityClass.
      - **Target.State** is set to DFS_STORAGE_STATE_ONLINE.
      - **Target.ServerName** is set to *ServerName*.
      - **Target.ShareName** is set to *RootShare*.
- The server MUST synchronously insert the **Namespace** object into the local information store.

3.1.4.4.2 NetrDfsRemoveStdRoot (Opnum 13)

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The NetrDfsRemoveStdRoot (Opnum 13) method deletes the specified stand-alone DFS namespace.<122> The DFS namespace can be removed without first removing all of the links in it.

The NetrDfsRemoveStdRoot method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsRemoveStdRoot(
  [in, string] WCHAR* ServerName,
  [in, string] WCHAR* RootShare,
  [in] DWORD ApiFlags
);
```

ServerName: The pointer to a null-terminated Unicode string. This is the host name of the DFS root target to be removed.

RootShare: The pointer to a null-terminated Unicode DFS root target share name string. This is also the DFS namespace name. The share is not removed automatically when the method is successful; it MUST be removed explicitly, as needed.

ApiFlags: This parameter is reserved for future use and is ignored by the server.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x00000490 ERROR_NOT_FOUND	The DFS namespace that the *ServerName* and *RootShare* parameters specify does not already exist.

The server MUST support the removal of a DFS namespace without requiring that all of the DFS links be removed first.

On receiving this method, the server MUST do the following:

- If there is no entry in the **NamespaceList** with the **NamespaceName** matching *RootShare*, then the RPC method MUST fail with ERROR_NOT_FOUND (0x00000490).
- Remove the **Namespace** object corresponding to the *RootShare* from the **NamespaceList**.
- Remove the **Namespace** object from the local information store.

The server SHOULD remove any intermediate directories and reparse points that were part of the namespace.

3.1.4.4.3 NetrDfsAddStdRootForced (Opnum 15)

The NetrDfsAddStdRootForced (Opnum 15) method creates a new stand-alone DFS namespace without checking for the availability and accessibility of the specified share.<123><124><125>

The NetrDfsAddStdRootForced method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsAddStdRootForced(
  [in, string] WCHAR* ServerName,
```


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```
    [in, string] WCHAR* RootShare,
    [in, string] WCHAR* Comment,
    [in, string] WCHAR* Share
);
```

ServerName: The pointer to a null-terminated Unicode string. This is the host name of the new DFS root target.

RootShare: The pointer to a null-terminated Unicode DFS root target share name string. This is also the DFS namespace name. This method does not create the share; it MUST be created separately.

Comment: The pointer to a null-terminated Unicode string that contains a comment associated with the DFS namespace. Used for informational purposes, this string has no protocol-specified restrictions on length or content. The comment is meant for human consumption and does not affect server functionality. This parameter MAY be a NULL pointer.

Share: The pointer to a null-terminated Unicode string that contains the local **file system** path corresponding to the share on the server receiving the RPC method, in the following form:

```
<X>:\<path>
```

where *<X>* is a drive letter (a single character from A to Z) and *<path>* is a file system path whose leaf component is a directory.

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.
0x000000B7 ERROR_ALREADY_EXISTS	The DFS namespace that the *ServerName* and *RootShare* parameters specify already exists.

The support for this method is optional. If supported, then the server MUST support the ability to create a DFS namespace even when the share that the *RootShare* parameter specifies is not available or accessible.

On receiving this method, the server MUST do the following.

- If there is any entry in the **NamespaceList** with the **NamespaceName** matching *RootShare*, then the RPC method MUST fail with ERROR_ALREADY_EXISTS (0x000000B7).
- Create and initialize the **Namespace** object, as specified in section 3.1.4.4.1, and insert it into the **NamespaceList**.
- The server MUST synchronously insert the **Namespace** object into the local information store.

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3.1.4.5 Domain-Based Namespace Methods

3.1.4.5.1 NetrDfsGetDcAddress (Opnum 16)

The NetrDfsGetDcAddress (Opnum 16) method returns the DC host name that is used by the DFS server to which the RPC method is issued.<126> The client MUST use this DC to create a domain-based DFS namespace, add a root target to a domain-based DFS namespace, remove a root target from a domain-based DFS namespace, or remove a domain-based DFS namespace.

The NetrDfsGetDcAddress method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsGetDcAddress(
  [in, string] WCHAR* ServerName,
  [in, out, string] WCHAR** DcName,
  [in, out] BOOLEAN* IsRoot,
  [in, out] unsigned long* Timeout
);
```

ServerName: A pointer to a null-terminated Unicode string. This is the host name of the server to which the RPC method is issued.<127>

DcName: A null-terminated Unicode string that contains the DC host name when the NetrDfsGetDcAddress method is successful.<128>

IsRoot: A pointer to a Boolean value, set to TRUE on return if the server hosts any DFS root target, and FALSE otherwise.<129>

Timeout: A pointer to an unsigned 32-bit integer value indicating the count of seconds for which the server will use the DC that is returned to access DFS metadata.<130>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.

A server MAY<131> implement this method if it supports domain-based DFS namespaces.

In the *DcName* parameter, the server SHOULD return the host name of the DC it is using to access DFS metadata for any domain-based DFS namespace that the server is hosting. If the server is not currently using a DC, it MUST determine a DC and return its name.

The server SHOULD also return a time-out value, in seconds, that is equal to the length of time that the server will be using the DC in the *Timeout* parameter, assuming that another RPC method does not change it.

The server uses the *IsRoot* parameter to specify whether it supports the ability to host more than one DFS namespace, and to indicate whether it is currently hosting a DFS namespace. If the server supports the ability to host more than one DFS namespace, it MUST return a value of FALSE in the *IsRoot* parameter, regardless of whether it is actually hosting a DFS namespace. If the server does not support the ability to host more than one DFS namespace, and if it currently hosts a DFS namespace, it SHOULD return a value of TRUE in the *IsRoot* parameter; otherwise, it SHOULD return FALSE.

3.1.4.5.2 NetrDfsSetDcAddress (Opnum 17)

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The NetrDfsSetDcAddress (Opnum 17) method instructs the server receiving the RPC method to use the specified DC for DFS metadata accesses for domain-based DFS namespaces.<132>

The NetrDfsSetDcAddress method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsSetDcAddress(
  [in, string] WCHAR* ServerName,
  [in, string] WCHAR* DcName,
  [in] DWORD Timeout,
  [in] DWORD Flags
);
```

ServerName: The pointer to a null-terminated Unicode string. This is the host name of the server to which the RPC method is issued.

DcName: The pointer to a null-terminated Unicode DC host name string.

Timeout: The time period, in seconds, that the server uses the specified DC when storing and retrieving domain-based DFS metadata. This is valid only when the NET_DFS_SETDC_TIMEOUT bit of the *Flags* parameter is set.

Flags: The bit field specifying additional operations to perform. Possible values are as follows.

Value	Meaning
NET_DFS_SETDC_FLAGS 0x00000000	Indicates that no additional operation is requested.
NET_DFS_SETDC_TIMEOUT 0x00000001	Sets the time-out value based on the *Timeout* parameter.
NET_DFS_SETDC_INIT_PKT 0x00000002	Instructs the called server to reload its DFS metadata from the specified DC.

All other bits are reserved and MUST NOT be used. If reserved bits are specified, the server MAY fail the call with an implementation-defined failure value.<133>

Return Values: The method MUST return 0 on success and a nonzero error code on failure. The method can return any specific error code value, as specified in [MS-ERREF] section 2.2. The most common error codes are listed in the following table.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000005 ERROR_ACCESS_DENIED	Permission to perform the operation was denied.

Servers MAY choose not to implement this method or implement it as a method with no effect that returns ERROR_SUCCESS.<134>

Otherwise, the server MUST update the DC it uses for accessing DFS metadata for the domain-based DFS namespace it is hosting with the specified DC. If no time-out is specified in the *Timeout* parameter (NET_DFS_SETDC_TIMEOUT is not set in the *Flags* parameter), the server MUST use its default time-out. The DC the server should use at the end of this time-out is implementation-defined.

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When NET_DFS_SETDC_INIT_PKT is set in the *Flags* parameter, the server SHOULD initiate a background synchronization of the domain-based DFS namespace it is hosting with either the DC specified by this method or the default DC the server is using. This MUST be treated as functionally equivalent to receiving a NetrDfsSetInfo (Opnum 3) method with the *Level* parameter value 101 and the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE.<135>

3.1.5 Timer Events

No protocol timer events are required on the client beyond the timers required in the underlying **RPC transport**.

3.1.6 Other Local Events

No additional local events are used on the client beyond the events maintained in the underlying RPC transport.

3.2 Client Details

3.2.1 Abstract Data Model

None.

3.2.2 Timers

No protocol timers are required beyond those used internally by the RPC method to implement resiliency to network outages, as specified in [MS-RPCE].

3.2.3 Initialization

The client creates an RPC binding handle to the server RPC method **endpoint** when an RPC method is called. For more information on binding handles, see [C706]. The client MAY create a separate binding handle for each method invocation, or it MAY reuse a binding handle for multiple invocations. The client MUST create an authenticated RPC binding handle.<136>

3.2.4 Message Processing Events and Sequencing Rules

The client MUST pass any error received from the invocation of an RPC method to the application that issued the RPC call.

On successful completion of methods returning lists of servers to notify (NetrDfsAdd2, NetrDfsRemove2, and NetrDfsSetInfo2), the application SHOULD notify the servers that the namespace metadata has been updated. This is done by issuing the NetrDfsSetDcAddress method to each server, specifying NET_DFS_SETDC_INITPKT on the *Flags* parameter.

As specified in section 3.1.4.5.2 and its references, issuing the NetrDfsSetDcAddress method will cause the targeted server to update the cached copy of the metadata it may hold. If this notification is not delivered, the specified servers could be unaware of the namespace metadata update for an indeterminate period of time. Such a failure to deliver the notification is normal, however, and may be due to client or application failure (for example a crash or a power or network outage).

The server recovers from notification failure because of the updating requirement in section 3.1.4. The updating requirement states the preconditions that a server MUST satisfy before processing an RPC method.

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3.2.4.1 Basic Methods

3.2.4.1.1 NetrDfsAdd (Opnum 1)

If a NetrDfsAdd call to the DFS root target fails with ERROR_NOT_SUPPORTED (0x00000032), an application may use this as an indication to issue the NetrDfsAdd2 method instead.<137>

3.2.4.1.2 NetrDfsRemove (Opnum 2)

If a NetrDfsRemove call fails with ERROR_NOT_SUPPORTED (0x00000032), an application may use this as an indication to issue the NetrDfsRemove2 method.<138>

3.2.4.1.3 NetrDfsSetInfo (Opnum 3)

If a NetrDfsSetInfo call fails with ERROR_NOT_SUPPORTED (0x00000032), an application may use this as an indication to issue the NetrDfsSetInfo2 method instead.<139>

3.2.4.1.4 NetrDfsEnum (Opnum 5) and NetrDfsEnumEx (Opnum 21)

An application may use either the NetrDfsEnum or the NetrDfsEnumEx method to enumerate roots and links. The application may use the value that NetrDfsManagerGetVersion returns, to determine the enumeration method to use.<140><141>

Due to the possibility of concurrent updates to the DFS namespace, an application SHOULD NOT assume completeness or uniqueness of the results returned when resuming an enumeration (for more information on NetrDfsEnum, see section 3.1.4.1.7).<142>

3.2.4.2 Extended Methods

3.2.4.2.1 NetrDfsAdd2 (Opnum 19)

An application MUST determine the PDC of a DFS root target server of the DFS namespace specified by the *DfsEntryPath* parameter and invoke the NetrDfsAdd2 method specifying the PDC.

If successful, the application SHOULD issue notifications to each server returned in the *ppRootList* parameter, as specified in section 3.2.4.

3.2.4.2.2 NetrDfsRemove2 (Opnum 20)

An application MUST determine the PDC of a DFS root target server of the DFS namespace specified by the *DfsEntryPath* parameter and invoke the NetrDfsRemove2 method specifying the PDC.

If successful, the application SHOULD issue notifications to each server returned in the *ppRootList* parameter, as specified in section 3.2.4.

3.2.4.2.3 NetrDfsSetInfo2 (Opnum 22)

An application MUST determine the PDC of a DFS root target server of the DFS namespace specified by the *DfsEntryPath* parameter and invoke the NetrDfsSetInfo2 method specifying the PDC.

If successful, the application SHOULD issue notifications to each server returned in the *ppRootList* parameter, as specified in section 3.2.4.

3.2.4.3 Root Target Methods

3.2.4.3.1 NetrDfsAddFtRoot (Opnum 10)

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The NetrDfsAddFtRoot method is supported only for a domainv1-based DFS namespace scenario.

An application MUST perform the following steps before invoking the NetrDfsAddFtRoot method:

1. Determine the PDC of the domain of the DFS root target server that the *ServerName* parameter specifies.
2. If an object of type *fTDfs* with the name of the domain-based DFS namespace does not already exist in the **DFS Configuration Container**, create a new object for the domain-based DFS namespace, as specified in section 2.3.3.
3. Update the ACL on the object of the DFS namespace to permit read/write access by the DFS root target server.
4. Call the NetrDfsFlushFtTable method on the PDC, specifying the DFS namespace name.
5. If all prior steps succeeded without error, then the client MUST issue the NetrDfsSetDcAddress (Opnum 17) method to each server that the *ppRootList* parameter returns.<143><144>

3.2.4.3.2 NetrDfsRemoveFtRoot (Opnum 11)

An application MUST determine the PDC of the domain of the DFS root target server that the *ServerName* parameter specifies.<145> If the *ApiFlags* parameter is not DFS_FORCE_REMOVE, the application MUST issue the RPC method to the DFS root target server that the *ServerName* parameter specifies; otherwise, the application MUST issue the RPC method to the PDC.

This method is supported only for a domainv1-based DFS namespace scenario. If a client application attempts to use it on a domainv2-based DFS namespace or target, the server MUST fail with a return value of ERROR_NOT_SUPPORTED.

If all prior steps succeeded without error, then the application MUST perform the following steps:

1. Invoke the NetrDfsSetDcAddress method to each server returned in the *ppRootList* parameter.<146>
2. Update the ACL on the object (as specified in section 2.3.3) of the DFS namespace to remove read/write access by the DFS root target server.
3. Remove the object itself if the **remoteServerName** attribute of the DFS namespace object (as specified in section 2.3.3) has exactly one value in it.
4. Call the NetrDfsFlushFtTable method on the PDC, specifying the DFS namespace name.

3.2.5 Timer Events

No protocol timer events are required on the client beyond those required in the underlying RPC call transport.

3.2.6 Other Local Events

No additional local events are used on the client beyond those maintained in the underlying RPC transport.

3.3 Domain Controller Details

A DC hosting a DFS root target MUST conform to the specification in section 3.1.

In addition, the DFS server on a DC MUST do the following:

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- Receive and respond to DFS root and DFS link referral requests for any domain-based DFS namespace in the domain. The DC need not be a DFS root target for the domain-based DFS namespace identified in the referral request.
- Receive and respond to the RPC methods, as specified in section 3.3.4.

3.3.1 Abstract Data Model

A DFS server on a DC MAY maintain the following data item:

- **ReferralCache:** A referral cache that is used when distributing referrals for domain-based DFS namespaces. This is for use by the DFS Referral Protocol, as specified in [MS-DFSC].

3.3.2 Timers

No protocol timers are required beyond those used internally by RPC to implement resiliency to network outages, as specified in [MS-RPCE].

3.3.3 Initialization

No initialization is required beyond that used internally by RPC, as specified in [MS-RPCE].

3.3.4 Message Processing Events and Sequencing Rules

A DC MAY<147> itself be a DFS root target. In such cases, it MUST process RPC methods, as specified in section 3.1. In addition, some methods SHOULD be specially supported, as specified in the following topics.

3.3.4.1 Basic Methods

3.3.4.1.1 NetrDfsRemoveRootTarget (Opnum 24)

A DFS server on a DC MUST support the DFS_FORCE_REMOVE value (0x80000000) for the *ApiFlags* parameter. DFS_FORCE_REMOVE value is used to delete a domain-based DFS namespace when the root target servers of the namespace are no longer available (for example, they have been decommissioned).

3.3.4.2 Extended Methods

3.3.4.2.1 NetrDfsEnumEx (Opnum 21)

A DFS server on a DC SHOULD support the *Level* parameter 200. The DFS server MUST validate the *DfsEntryPath* parameter against the name of the domain to which the DC is joined, and fail with ERROR_INVALID_NAME (0x0000007B) if it does not match. The DFS server then returns the list of domain-based DFS namespaces in the domain. This MUST be returned by performing an LDAP search for objects on the domain controller under the container. The container has the following DN:

```
CN=Dfs-Configuration,CN=System,<domain>
```

where <*domain*> is the DN of the domain. For details and more information, see section 2.3.1.<148>

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3.3.4.3 Root Target Methods

3.3.4.3.1 NetrDfsRemoveFtRoot (Opnum 11)

A DFS server on a DC MUST support the DFS_FORCE_REMOVE value (0x80000000) for the *ApiFlags* parameter. The DFS_FORCE_REMOVE value is used to delete a domain-based DFS namespace when the root target servers of the namespace are no longer available (for example, decommissioned).

3.3.4.3.2 NetrDfsFlushFtTable (Opnum 18)

The NetrDfsFlushFtTable method instructs the DFS server on a DC to purge the specified domainv1-based DFS entry from any DFS root referral cache it may have.

Note This method MUST fail on non-DC servers, as specified in this section.

The NetrDfsFlushFtTable method uses the following MIDL syntax.

```
NET_API_STATUS NetrDfsFlushFtTable(
  [in, string] WCHAR* DcName,
  [in, string] WCHAR* wszFtDfsName
);
```

DcName: The pointer to a null-terminated Unicode string that contains the host name of the DC to which the RPC method is issued.

wszFtDfsName: The pointer to a null-terminated Unicode string that contains the name of the domain-based DFS namespace.

Return Values: This method MUST return 0 on success and a nonzero error code on failure. The values transmitted in this field are implementation-specific. For protocol purposes, all nonzero values MUST be treated as equivalent failures.

Note This method MUST return ERROR_NOT_SUPPORTED on non-DC servers.

Return value/code	Description
0x00000000 ERROR_SUCCESS	Successful completion.
0x00000032 ERROR_NOT_SUPPORTED	Operation not supported. This MUST be returned if the server does not implement the method.

The server MAY choose not to implement this method.<149> If it does, ERROR_NOT_SUPPORTED MUST be returned.

3.3.5 Timer Events

No protocol timer events are required on the client beyond the timers required in the underlying RPC transport.

3.3.6 Other Local Events

No additional local events are used on the client beyond the events maintained in the underlying RPC transport.

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4 Protocol Examples

The following examples for domainv1 are in a Windows Server 2003 operating system domain; the client used is Windows XP operating system Service Pack 2 (SP2). The member servers and domain controllers used in the example are all Windows Server 2003 operating system with Service Pack 1 (SP1).

For domainv2, the client is Windows Vista operating system. The member servers and domain controllers in this scenario are all Windows Server 2008 operating system.

4.1 Creating a New Domainv1-Based DFS Namespace

The following example describes the steps used to create a new domainv1-based DFS namespace. The namespace name is testroot1, to be created on a server named CFS-41X-2C02 within the dfsn-dev.microsoft.com domain.

1. A client determines whether a new domainv1-based DFS namespace is being created, or a new DFS root target is being added to an existing domain-based DFS namespace, by issuing an LDAP search for the object corresponding to the domainv1-based DFS namespace. The following illustration shows the LDAP search parameters that do this.
2. Because the domainv1-based DFS namespace does not already exist, the DC fails the LDAP search with LDAP_NO_SUCH_OBJECT.
3. The client creates an object for the new domainv1-based DFS namespace.
4. Object creation is successful.
5. The client updates the ACL on the object to permit the new DFS root target to update the object.
6. The ACL change on the object is successful.
7. The client issues a NetrDfsAddFtRoot method to the DFS root target server.
8. The DFS root target creates the DFS metadata required for the new domainv1-based DFS namespace and updates the DFS metadata in the object corresponding to the DFS namespace. This is shown as an LDAP modify operation to the PDC for the domain. The following illustration shows the LDAP modify parameters that do this.
9. The DFS metadata write is successful.
10. The DFS root target completes the NetrDfsAddFtRoot method to the client.

The following illustration shows the sequence of events.

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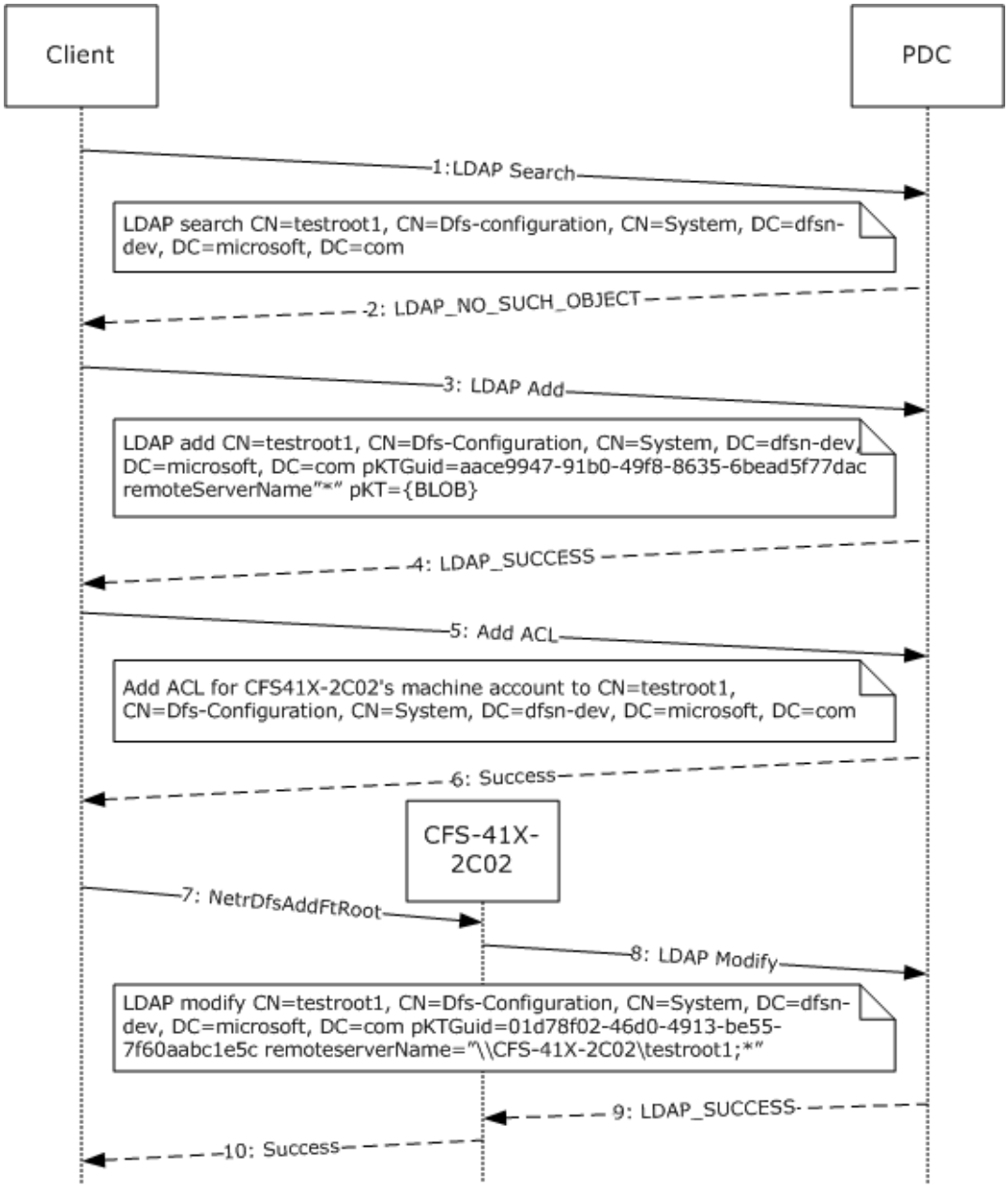

Figure 2: Creating a new domainv1-based DFS namespace

4.2 Adding a Root Target to an Existing Domainv1-Based DFS Namespace

The following example describes the steps used to create a new root target in an existing domainv1-based DFS namespace.

1. The client determines whether a new domainv1-based DFS namespace is being created or a new DFS root target is being added to an existing domainv1-based DFS namespace, by issuing an LDAP search for the object corresponding to the domainv1-based DFS namespace to the PDC.

2. Because the domainv1-based DFS namespace already exists, the LDAP search is successful.

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3. The client updates the ACL on the object to permit the new DFS root target CFS-41X-2C03 to update the object.

4. The ACL change on the object is successful.

5. The client issues a NetrDfsAddFtRoot method to the new DFS root target server CFS-41X-2C03.

6. The DFS root target server CFS-41X-2C03 creates the DFS metadata required for the new domainv1-based DFS namespace and writes it to the PDC for the domain. The following illustration shows the LDAP modify parameters that do this.

7. The DFS metadata write is successful.

8. The DFS root target CFS-41X-2C03 completes the NetrDfsAddFtRoot method to the client.

The following illustration shows the sequence of events.

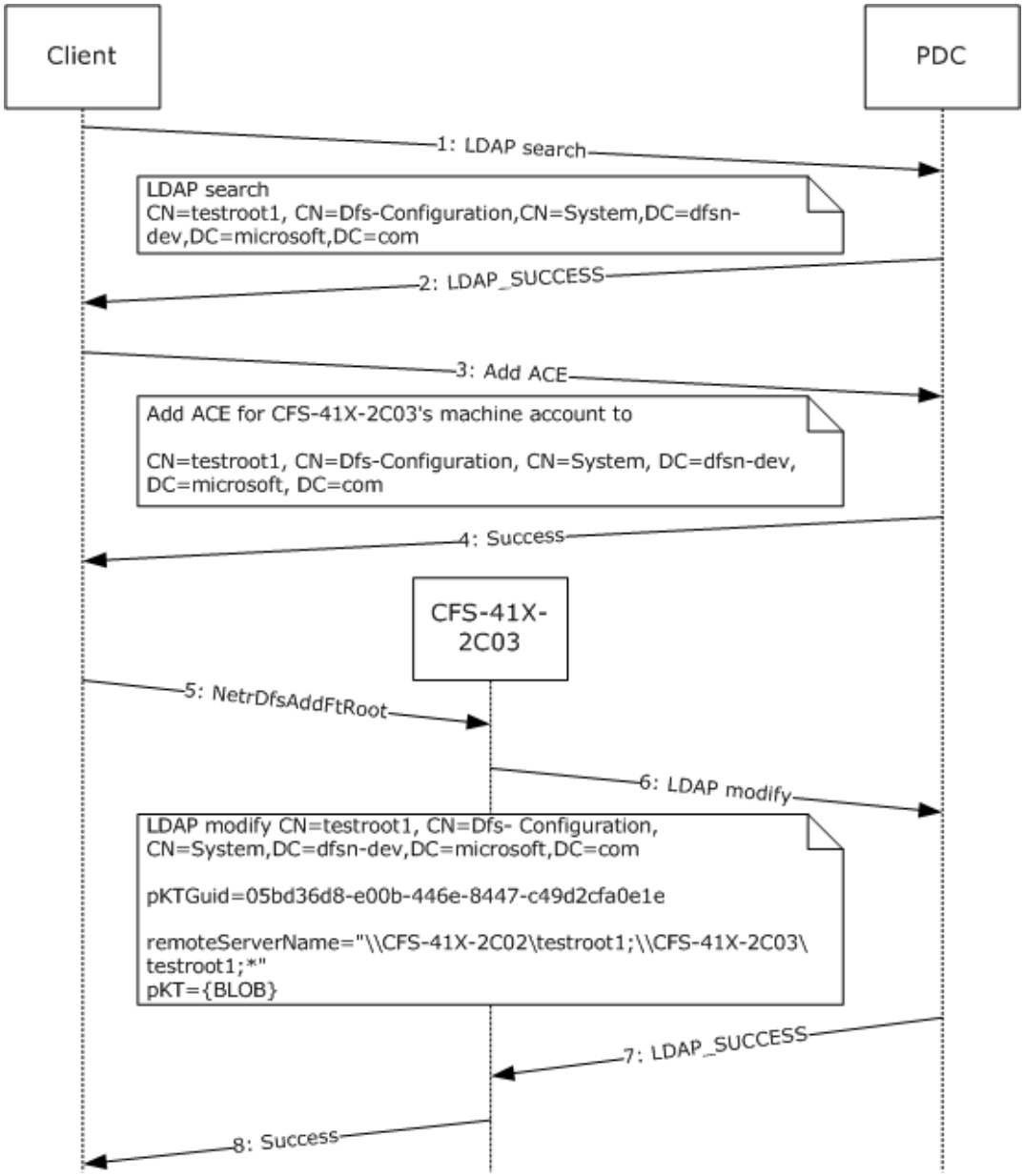

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Figure 3: Adding a root target to an existing domainv1-based DFS namespace

4.3 Adding a New Link to a Domain-Based DFS Namespace

The following example describes the steps for adding a new DFS link to an existing domainv1-based DFS namespace that has two root targets. The illustration in this example also shows how the DFS root target uses NetrDfsSetInfo, *Level* parameter 101, and DFS_VOLUME_STATE_RESYNCHRONIZE to update the DFS metadata of the domain-based DFS namespace with the new DFS link information, and then notifies the other root targets.

1. A client issues a NetrDfsAdd RPC method to the DFS root target CFS-41X-2C02 for the domainv1-based DFS namespace.
2. The DFS root target CFS-41X-2C02 issues an LDAP search operation to retrieve the **pKTGuid** attribute in the object for the domainv1-based DFS namespace to the PDC for the domain. The following illustration shows the DN of the object and the attribute searched.
3. The LDAP search is successful, and the value of the **PktGuid** attribute is returned.
4. The DFS root target CFS-41X-2C02 determines that the DFS metadata in its cache is up-to-date and determines whether the new link target is already in another DFS namespace. This is done by issuing the **NetrShareGetInfo** method, as specified in [MS-SRVS], specifying a *Level* parameter 1005 to the DFS link target CFS-44X-2B08 to check the link target share's properties. For more information on the **NetrShareGetInfo** method, see [MS-SRVS].
5. The **NetrShareGetInfo** RPC method returns an indication that the DFS link target share is not a DFS namespace. This information is used to determine the value of the PKT_ENTRY_TYPE_OUTSIDE_MY_DOM bit of the **Type** field of the DFSRootOrLinkIDBLOB (for more information, see section 2.3.3.1.1.2) for the DFS link. For this example, the bit is set to 0.
6. DFS link target CFS-41X-2C02 issues an LDAP modify operation to the PDC with a new **pKTGuid** value and the updated DFS metadata containing the new DFS link information.
7. The LDAP modify operation is successful.
8. The NetrDfsAdd method invoked by the client completes successfully.
9. The DFS root target, which updated the DFS metadata, issues the NetrDfsSetInfo method with the *Level* parameter 101 and the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE to all of the other root targets. CFS-41X-2C02, in this example, is notifying CFS-41X-2C03.
10. On receiving the NetrDfsSetInfo method, *Level* parameter 101, and DFS_VOLUME_STATE_RESYNCHRONIZE, CFS-41X-2C03 issues an LDAP search to the PDC to verify whether the DFS metadata in its cache is up-to-date.
11. The LDAP search operation is successful and contains the **pKTGuid** attribute's value.
12. CFS-41X-2C03 determines that the cached DFS metadata it has needs to be refreshed. It then issues an LDAP search operation to retrieve the value of the **pKT** attribute, which contains the actual DFS metadata.
13. The LDAP search is successful and contains the DFS metadata in the reply.
14. In this example, CFS-41X-2C03 performs the required changes to its local state by adding the new DFS link. The NetrDfsSetInfo method that CFS-41X-2C02 issued is then completed.

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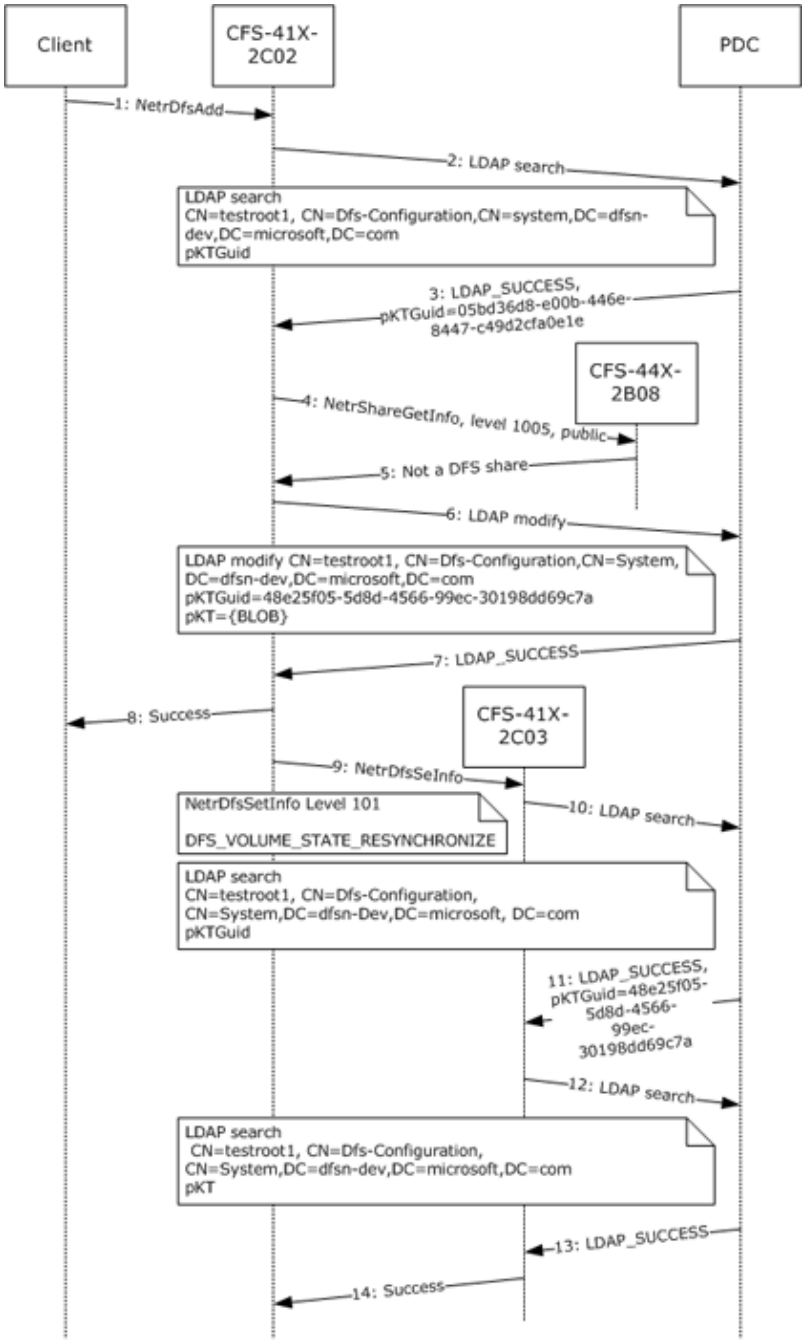

Figure 4: Adding a new link to a domainv1-based DFS namespace

4.4 Creating a New Domainv2-Based DFS Namespace

The following example describes the steps used to create a new domainv2-based DFS namespace.

1. A client determines whether a new domainv2-based DFS namespace is being created or a new DFS root target is being added to an existing domainv2-based DFS namespace, by issuing an LDAP search for the object corresponding to the domainv2-based DFS namespace. The following illustration shows the LDAP search parameters that do this.

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2. Because the domainv2-based DFS namespace does not already exist, the DC fails the LDAP search with LDAP_NO_SUCH_OBJECT.

3. The client creates an object for the new domainv2-based DFS namespace.

4. Object creation is successful.

5. The client updates the ACL on the object to permit the new DFS root target CFS-41X-2C02 to update the object.

6. The ACL change on the object is successful.

7. The client issues a NetrDfsAddRootTarget method to the DFS root target server.

8. The DFS root target server creates a new DFS namespace LDAP entry with the DFS namespace anchor LDAP entry as its parent. The server also creates the DFS metadata required for the new domainv2-based DFS namespace and updates the DFS metadata in the object corresponding to the DFS namespace. This appears as an LDAP modify operation to the PDC for the domain. The following illustration shows the LDAP modify parameters that do this.

9. The DFS metadata write is successful.

10. The DFS root target completes the NetrDfsAddRootTarget method to the client.

The following illustration shows this sequence of events.

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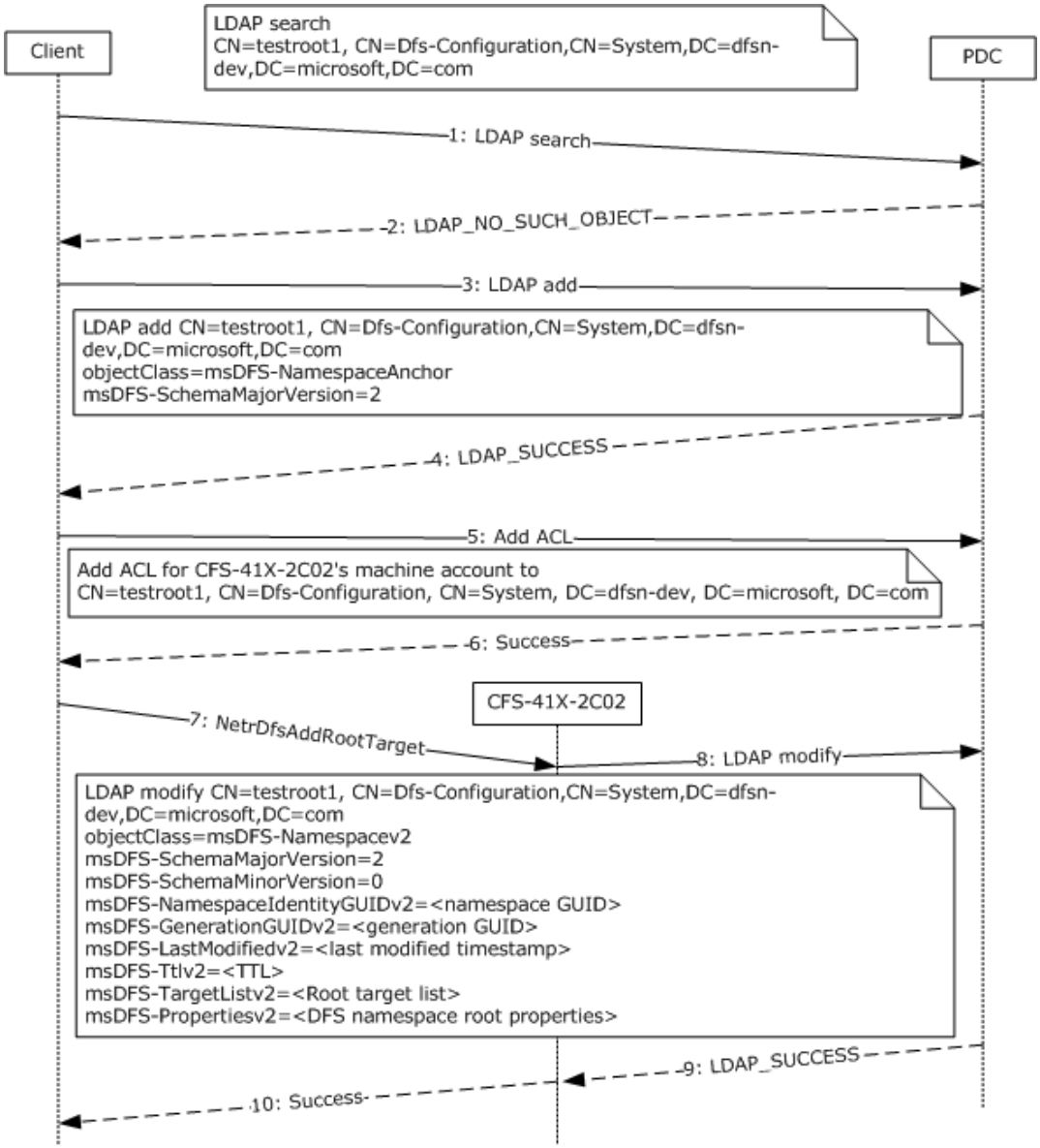

Figure 5: Creating a new domainv2-based DFS namespace

4.5 Adding a Root Target to an Existing Domainv2-Based DFS Namespace

The following example describes the steps used to create a new root target in an existing domainv2-based DFS namespace.

1. The client determines whether a new domainv2-based DFS namespace is being created, or a new DFS root target is being added to an existing domainv2-based DFS namespace, by issuing an LDAP search for the object corresponding to the domainv2-based DFS namespace to the PDC.

2. Because the domainv2-based DFS namespace already exists, the LDAP search is successful.

3. The client updates the ACL on the object to permit the new DFS root target CFS-41X-2C03 to update the object.

4. The ACL change on the object is successful.

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5. The client issues a NetrDfsAddRootTarget method to the new DFS root target server CFS-41X-2C03.

6. The DFS root target server CFS-41X-2C03 creates the DFS metadata required for the new domainv2-based DFS namespace and writes it to the PDC for the domain. The following illustration shows the LDAP modify parameters that do this.

7. The DFS metadata write is successful.

8. The DFS root target CFS-41X-2C03 completes the NetrDfsAddRootTarget method to the client.

The following illustration shows the sequence of events.

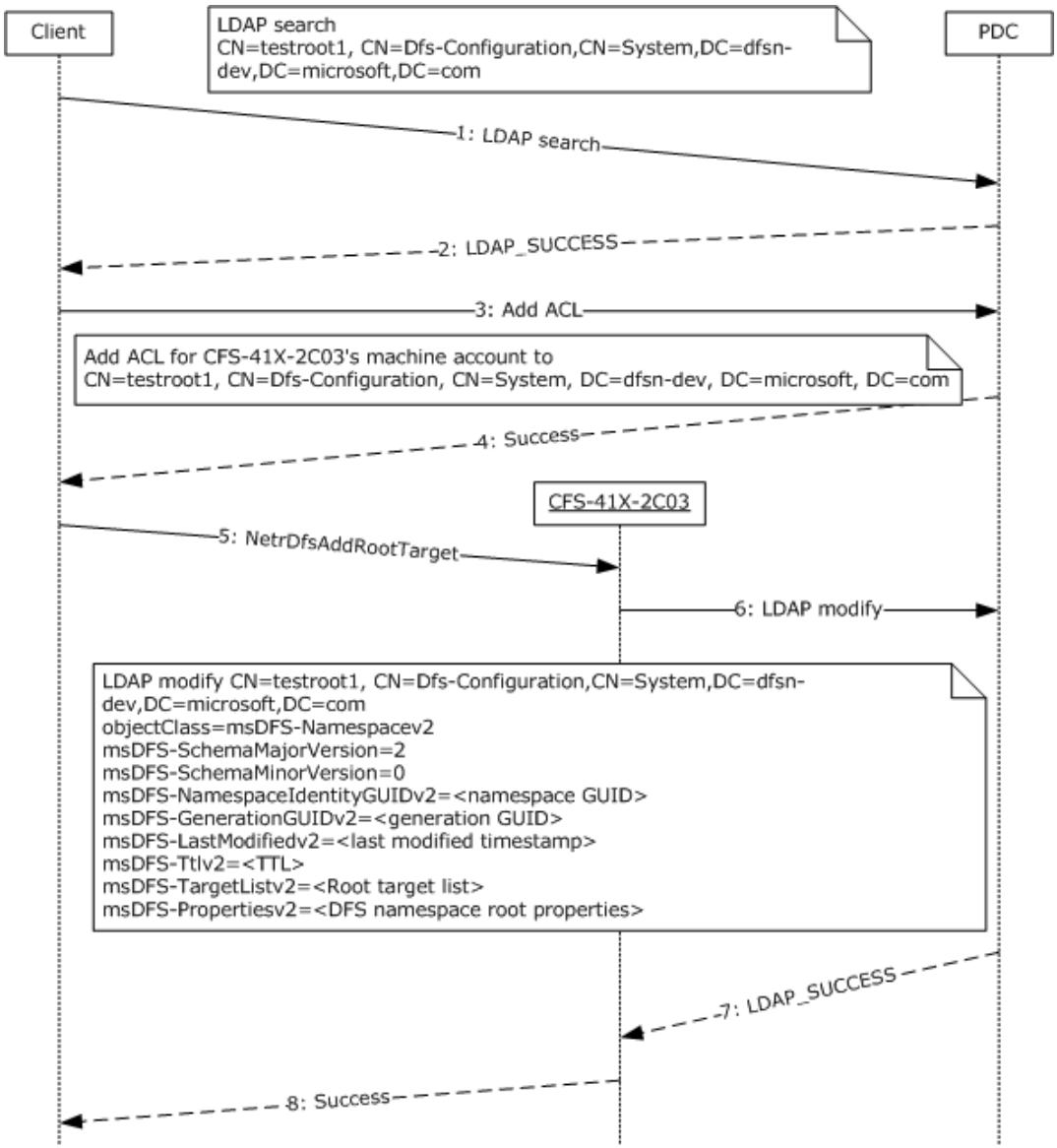

Figure 6: Adding a root target to an existing domainv2-based DFS namespace

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4.6 Adding a New Link to a Domainv2-Based DFS Namespace

The following example describes the steps used to add a new DFS link to an existing domainv2-based DFS namespace with two root targets. The illustration in this example also shows how the DFS root target uses NetrDfsSetInfo, *Level* parameter 101, and DFS_VOLUME_STATE_RESYNCHRONIZE, to update the DFS metadata of the domain-based DFS namespace with the new DFS link information, and then notifies the other root targets.

1. A client issues a NetrDfsAdd RPC method to the DFS root target CFS-41X-2C02 for the domainv2-based DFS namespace.

2. The DFS root target CFS-41X-2C02 performs either a full synchronization or an incremental synchronization. A full synchronization is performed if the DFS root target server is switching to a new PDC or if the DC that the synchronization operation is currently using is different from that in the <uSNChanged, DC invocation ID> tuple that was saved at the start of a previous full synchronization for the DFS namespace. An incremental synchronization is performed if the DFS root target server is already syncing with the PDC.

3. An incremental synchronization is done by issuing an LDAP search operation for the DFS namespace LDAP entry subtree to determine whether in any of the object classes of msDFS-Namespacev2, msDFS-Linkv2, or msDFS-DeletedLinkv2 the uSNChanged is greater than the saveduSNChanged value, where saveduSNChanged is the uSNChanged value from the tuple <uSNChanged, DC invocation ID> that was saved previously.

4. The DFS root target CFS-41X-2C02 determines that the DFS metadata in its cache is up-to-date and whether the new link points to another DFS namespace.

5. DFS link target CFS-41X-2C02 issues an LDAP modify operation to the PDC with a new identity GUID (msDFS-LinkIdentityGUID) value and the updated DFS metadata that contains the new DFS link information. The link identity GUID is set at DFS link creation time and does not change for the lifetime of the LDAP entry. It is used to locate the in-memory data structure that corresponds to the DFS link in the DFS metadata cache.

6. The LDAP modify operation is successful.

7. The NetrDfsAdd method invoked by the client completes successfully.

8. To perform a full synchronization to ensure that this is propagated to all other root targets, the DFS root target, which updated the DFS metadata, issues the NetrDfsSetInfo method, with the *Level* parameter 101 and the **State** field of DFS_INFO_101 set to DFS_VOLUME_STATE_RESYNCHRONIZE, to all of the other root targets. This is used to identify added or deleted DFS links. In this example, CFS-41X-2C02 is notifying CFS-41X-2C03.

9. On receiving the NetrDfsSetInfo method with *Level* parameter 101 and DFS_VOLUME_STATE_RESYNCHRONIZE, CFS-41X-2C03 issues an LDAP search to the PDC to verify whether the DFS metadata in its cache is up-to-date. A different uSNChanged value from the <uSNChanged, DC invocation ID> tuple saved at the start of a previous full sync would indicate what has changed, and it would subsequently perform an incremental sync to propagate any DFS metadata change.

10. CFS-41X-2C03 determines that the cached DFS metadata it has needs to be refreshed. It then issues an LDAP search operation to retrieve the attributes associated with the msDFS-Linkv2 class, which contains the actual DFS metadata.

11. The LDAP search is successful and contains the DFS metadata in the reply.

12. In this example, CFS-41X-2C03 performs the required changes to its local state by adding the new DFS link. The NetrDfsSetInfo method that CFS-41X-2C02 issued is then completed.

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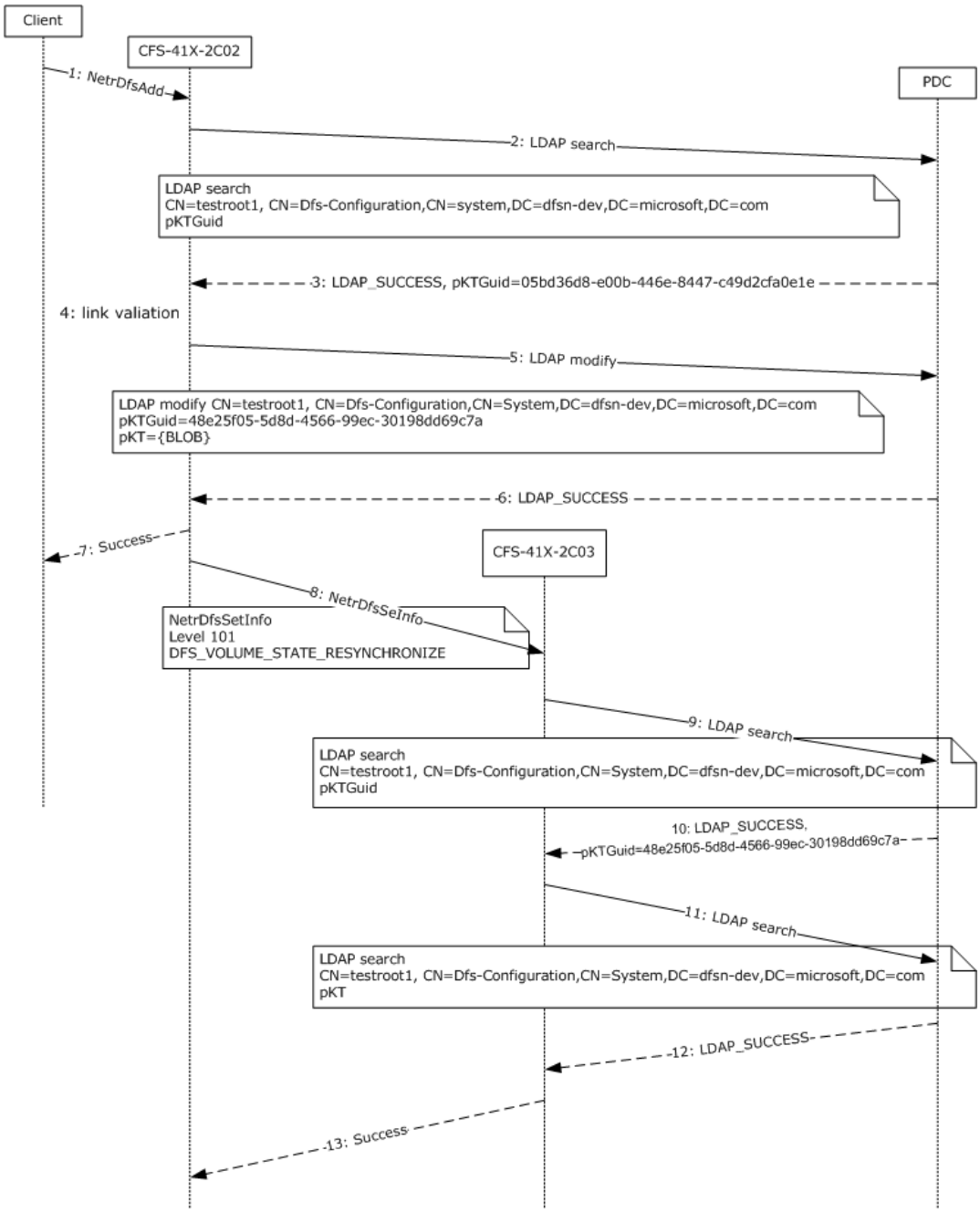

Figure 7: Adding a new link to a domainv2-based DFS namespace

4.7 Enumerating DFS Links in a Domain-Based DFS Namespace

The following example describes the sequence of an interactive administration application that enumerates all domain-based DFS namespaces in a domain and all DFS links of a domain-based DFS namespace.

1. To enumerate all of the domain-based DFS namespaces in the dfsn-dev domain, the administration application issues the NetrDfsEnumEx RPC method with the *DfsEntryPath* parameter `\\dfsn-dev` and *Level* parameter 200. This method is issued to the DC.

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2. The DC returns two domain-based DFS namespaces in the domain: `\\dfsn-dev\testroot1` and `\\dfsn-dev\testroot2`.

3. The user decides to view information about the domain-based DFS namespace `\\dfsn-dev\testroot1`. Before the administering application can issue the RPC method to obtain information about that DFS namespace, it must determine which DFS root target it will issue the RPC method to. This is done by issuing a DFS root referral request to the DC, as specified in [MSDFS].

4. The DC responds to the DFS root referral request with the two DFS root targets: `\\cfs-41x-2c02\testroot1` and `\\cfs-41x-2c03\testroot1`.

5. The NetrDfsEnumEx RPC method to obtain information about the DFS namespace `\\dfsn-dev\testroot1` is then issued to the root target `cfs-41x-2c02`.

6. The root target returns the DFS root and one DFS link in the domain-based DFS namespace.

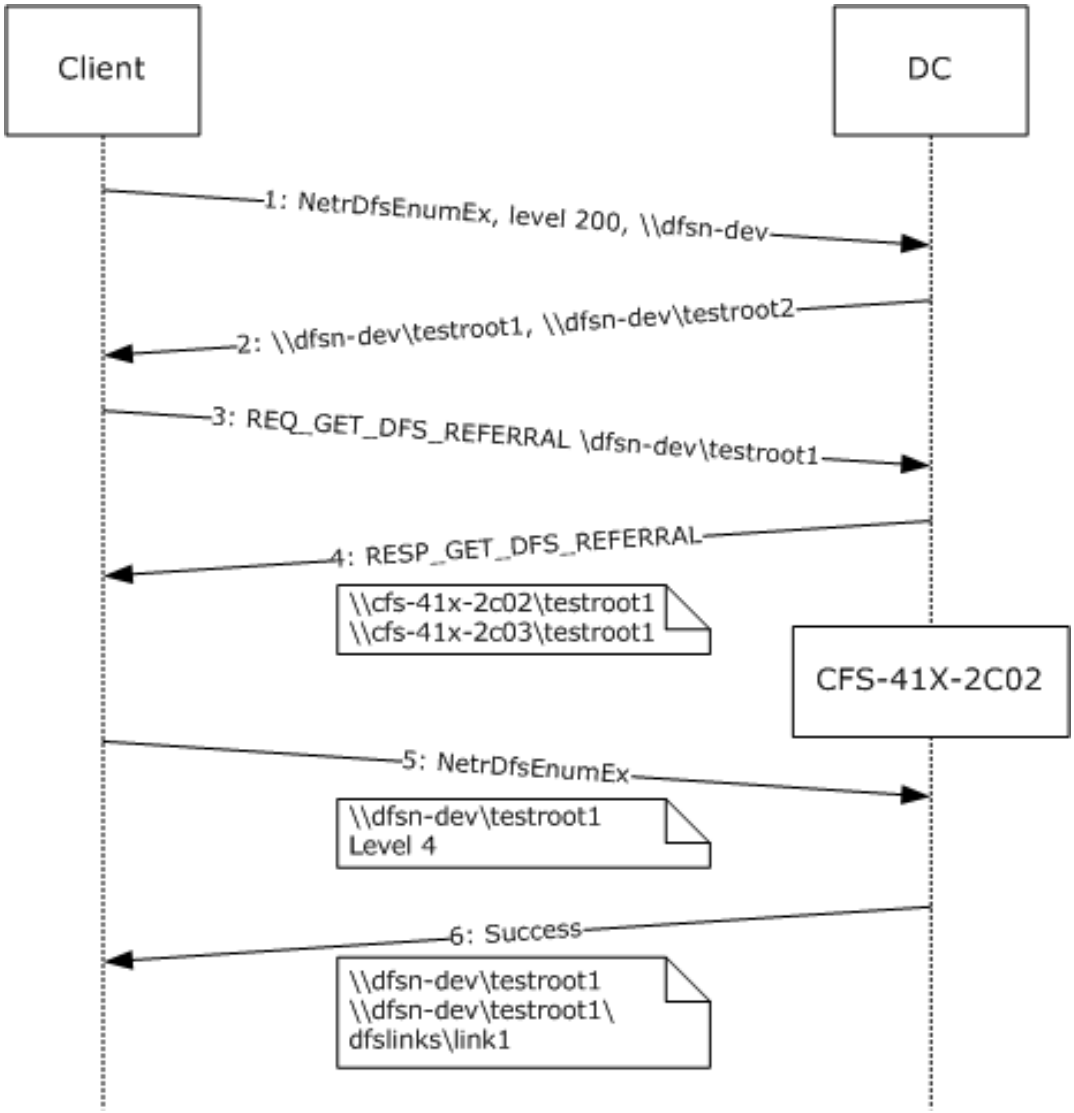

Figure 8: Enumerating DFS links in a domainv1-based DFS namespace

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4.8 DFS Metadata of a Domainv1-Based DFS Namespace

This example uses the following domainv1-based DFS namespaces:

- DFS root: `\\dfsn-dev\testroot1`
- DFS root targets: `\\cfs-41x-2c02\testroot1` and `\\cfs-41x-2c03\testroot1`
- DFS link: `\\dfsn-dev\testroot1\dfslinks\link1`
- DFS link target `\\cfs-44x-2b08\public`

The following illustration shows the hexadecimal dump of the DFS metadata for this domainv1-based DFS namespace. The offsets in the hexadecimal dump are used to explain the dump.

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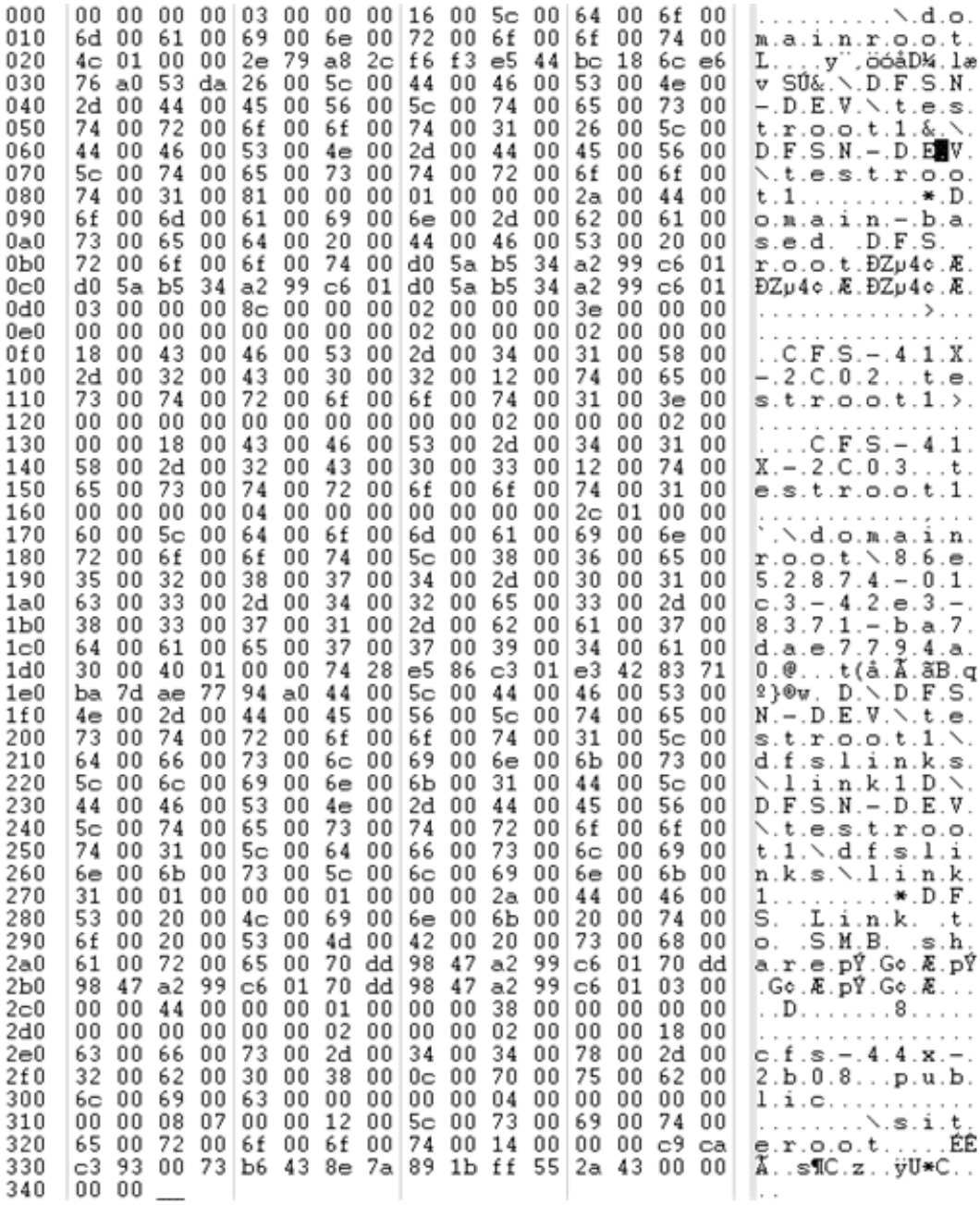

Figure 9: Hexadecimal dump of the DFS metadata for a domainv1-based DFS namespace

The following table lists elements of the hexadecimal dump.

Offset	Raw hex values	DFS metadata field
0x000	00 00 00 00	BLOBVersion: 0
0x004	03 00 00 00	BLOBElementCount: 3
0x008	-	DFSNamespaceElementBLOB #1
0x008	16 00	BLOBNameSize: 0x0016 (22)

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Offset	Raw hex values	DFS metadata field
0x00A	5C 00 64 00 6F 00 6D 00 61 00 69 00 6E 00 72 00 6F 00 6F 00 74 00	BLOBName: \domainroot
0x020	4C 01 00 00	BLOBDataSize: 0x0000014c (332)
0x024	-	DFSNamespaceRootBLOB
0x024	-	DFSRootOrLinkIDBLOB
0x024	2E 79 A8 2C F6 F3 E5 44 BC 18 6C E6 76 A0 53 DA	RootOrLinkGuid: 2ca8792e-f3f6-44e5-bc18-6ce676a053da
0x034	26 00	PrefixSize: 0x0026 (38)
0x036	5C 00 44 00 46 00 53 00 4E 00 2D 00 44 00 45 00 56 00 5C 00 74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00	Prefix: \DFSN-DEV\testroot1
0x05C	26 00	ShortPrefixSize: 0x0026 (38)
0x05E	5C 00 44 00 46 00 53 00 4E 00 2D 00 44 00 45 00 56 00 5C 00 74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00	Short prefix: \DFSN-DEV\testroot1
0x084	81 00 00 00	Type: 0x00000081
0x088	01 00 00 00	State: 0x00000001
0x08C	2A 00	CommentSize: 0x002A (42)
0x08E	44 00 6F 00 6D 00 61 00 69 00 6E 00 2D 00 62 00 61 00 73 00 65 00 64 00 20 00 44 00 46 00 53 00 20 00 72 00 6F 00 6F 00 74 00	Comment: Domain-based DFS root
0x0B8	D0 5A B5 34 A2 99 C6 01	PrefixTimeStamp: June 26, 2006 21:28:57
0x0C0	D0 5A B5 34 A2 99 C6 01	StateTimeStamp: June 26, 2006 21:28:57
0x0C8	D0 5A B5 34 A2 99 C6 01	CommentTimeStamp: June 26, 2006 21:28:57
0x0D0	03 00 00 00	Version: 0x0000003
0x0D4	8C 00 00 00	DFSTargetListBLOBSize: 0x0000008C (140)
0x0D8	-	DFSTargetListBLOB
0x0D8	02 00 00 00	TargetCount: 0x00000002
0x0DC	-	TargetEntryBLOB

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Offset	Raw hex values	DFS metadata field
0x0DC	3E 00 00 00	TargetEntrySize: 0x0000003E (62)
0x0E0	00 00 00 00 00 00 00 00	TargetTimeStamp: 0
0x0E8	02 00 00 00	TargetState: 0x00000002
0x0EC	02 00 00 00	TargetType: 0x00000002
0x0F0	18 00	ServerNameSize: 0x0018 (24)
0x0F2	43 00 46 00 53 00 2D 00 34 00 31 00 58 00 2D 00 32 00 43 00 30 00 32 00	ServerName: CFS-41X-2C02
0x10A	12 00	ShareNameSize: 0x0012 (18)
0x10C	74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00	ShareName: testroot1
0x11E	-	TargetEntryBLOB
0x11E	3E 00 00 00	TargetEntrySize: 0x0000003E (62)
0x122	00 00 00 00 00 00 00 00	TargetTimeStamp: 0
0x12A	02 00 00 00	TargetState: 0x00000002
0x12E	02 00 00 00	TargetType: 0x00000002
0x132	18 00	ServerNameSize: 0x0018 (24)
0x134	43 00 46 00 53 00 2D 00 34 00 31 00 58 00 2D 00 32 00 43 00 30 00 33 00	ServerName: CFS-41X-2C03
0x14C	12 00	ShareNameSize: 0x0012 (18)
0x14E	74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00	ShareName: testroot1
0x160	00 00 00 00	Padding
0x164	04 00 00 00	ReservedBLOBSize: 0x00000004
0x168	00 00 00 00	ReservedBLOB: 0x00000000
0x16C	2C 01 00 00	TTL: 0x0000012C (300 Seconds)
0x170	60 00	BLOBNameSize: 0x0060 (96)
0x172	5C 00 64 00 6F 00 6D 00 61 00 69 00 6E 00 72 00 6F 00 6F 00 74 00 5C 00 38 00 36 00 65 00 35 00 32 00 38 00 37 00 34 00 2D 00 30 00 31 00 63 00	BLOBName: \domainroot\86e52874-01c3-42e3-8371-ba7dae7794a0

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Offset	Raw hex values	DFS metadata field
	33 00 2D 00 34 00 32 00 65 00 33 00 2D 00 38 00 33 00 37 00 31 00 2D 00 62 00 61 00 37 00 64 00 61 00 65 00 37 00 37 00 39 00 34 00 61 00 30 00	
0x1D2	40 01 00 00	BLOBDataSize: 0x00000140 (320)
0x1D6	-	DFSNamespaceLinkBLOB
0x1D6	-	DFSRootOrLinkIDBLOB
0x1D6	74 28 E5 86 C3 01 E3 42 83 71 BA 7D AE 77 94 A0	RootOrLinkGuid: 86e52874-1c3-42e3-8371-ba7dae7794a0
0x1E6	44 00	PrefixSize: 0x0044 (68)
0x1E8	5C 00 44 00 46 00 53 00 4E 00 2D 00 44 00 45 00 56 00 5C 00 74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00 5C 00 64 00 66 00 73 00 6C 00 69 00 6E 00 6B 00 73 00 5C 00 6C 00 69 00 6E 00 6B 00 31 00	Prefix: \DFSN-DEV\testroot1\dfslinks\link1
0x22C	44 00	ShortPrefixSize: 0x0044 (68)
0x22E	5C 00 44 00 46 00 53 00 4E 00 2D 00 44 00 45 00 56 00 5C 00 74 00 65 00 73 00 74 00 72 00 6F 00 6F 00 74 00 31 00 5C 00 64 00 66 00 73 00 6C 00 69 00 6E 00 6B 00 73 00 5C 00 6C 00 69 00 6E 00 6B 00 31 00	Short prefix: \DFSN-DEV\testroot1\dfslinks\link1
0x272	01 00 00 00	Type: 0x00000001
0x276	01 00 00 00	State: 0x00000001
0x27A	2A 00	CommentSize: 0x002A (42)
0x27C	44 00 46 00 53 00 20 00 4C 00 69 00 6E 00 6B 00 20 00 74 00 6F 00 20 00 53 00 4D 00 42 00 20 00 73 00 68 00 61 00 72 00 65 00	Comment: DFS link to SMB share
0x2A6	70 DD 98 47 A2 99 C6 01	PrefixTimeStamp: June 26, 2006 21:29:29

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Offset	Raw hex values	DFS metadata field
0x2AE	70 DD 98 47 A2 99 C6 01	StateTimeStamp: June 26, 2006 21:29:29
0x2B6	70 DD 98 47 A2 99 C6 01	CommentTimeStamp: June 26, 2006 21:29:29
0x2BE	03 00 00 00	Version: 3
0x2C2	44 00 00 00	DFSTargetListBLOBSize: 0x00000044 (68)
0x2C6	-	DFSTargetListBLOB
0x2C6	01 00 00 00	TargetCount: 0x00000001
0x2CA	-	TargetEntryBLOB
0x2CA	38 00 00 00	TargetEntrySize: 0x00000038 (56)
0x2CE	00 00 00 00 00 00 00 00	TargetTimeStamp: 0
0x2D6	02 00 00 00	TargetState: 0x00000002
0x2DA	02 00 00 00	TargetType: 0x00000002
0x2DE	18 00	ServerNameSize: 0x0018 (24)
0x2E0	63 00 66 00 73 00 2D 00 34 00 34 00 78 00 2D 00 32 00 62 00 30 00 38 00	ServerName: cfs-44x-2b08
0x2F8	0C 00	ShareNameSize: 0x000C (12)
0x2FA	70 00 75 00 62 00 6C 00 69 00 63 00	ShareName: public
0x306	00 00 00 00	Padding
0x30A	04 00 00 00	ReservedBLOBSize: 0x00000004
0x30E	00 00 00 00	ReservedBLOB
0x312	08 07 00 00	TTL: 0x00000708 (1800 Seconds)
0x316	12 00	BLOBNameSize: 0x0012 (18)
0x318	5C 00 73 00 69 00 74 00 65 00 72 00 6F 00 6F 00 74 00	BLOBName: \siteroot
0x32A	14 00 00 00	BLOBDataSize: 0x00000014 (20)
0x32E	-	SiteInformationBLOB
0x32E	C9 CA C3 93 00 73 B6 43 8E 7A 89 1B FF 55 2A 43	SiteTableGuid: 93c3cac9-7300-43b6-8e7a-891bff552a43
0x33E	00 00 00 00	SiteEntryCount: 0x00000000

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5 Security

5.1 Security Considerations for Implementers

The DFS: Namespace Management Protocol allows any user to establish a connection to the RPC server. The protocol uses the underlying RPC Protocol to retrieve the identity of the caller that made the method call, as specified in [MS-RPCE] section 3.3.3.4.3. Clients SHOULD create an authenticated RPC connection. Servers SHOULD use this identity to perform method-specific access checks.<150>

5.2 Index of Security Parameters

The only security parameter is Authentication Protocol, section 2.1.

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6 Appendix A: Full IDL

The DFS: Namespace Management Protocol contains one interface, whose IDL definition is listed in this section.

```
import "ms-dtyp.idl";

/* ----- structures and methods described [MS-DFSNM], section 2 and 3 ----- */

[
    uuid(4fc742e0-4a10-11cf-8273-00aa004ae673),
    version(3.0),
    ms_union,
    pointer_default(unique)
]

interface netdfs {

typedef DWORD    NET_API_STATUS;
typedef WCHAR *  NETDFS_SERVER_OR_DOMAIN_HANDLE;

typedef [v1 enum] enum  DFS TARGET PRIORITY CLASS {
    DfsInvalidPriorityClass        = -1,
    DfsSiteCostNormalPriorityClass = 0,
    DfsGlobalHighPriorityClass     = 1,
    DfsSiteCostHighPriorityClass   = 2,
    DfsSiteCostLowPriorityClass    = 3,
    DfsGlobalLowPriorityClass      = 4
} DFS TARGET PRIORITY CLASS;

typedef struct _DFS_TARGET_PRIORITY {
    DFS_TARGET_PRIORITY_CLASS TargetPriorityClass;
    unsigned short            TargetPriorityRank;
    unsigned short            Reserved;
} DFS TARGET PRIORITY;

typedef struct _DFS_STORAGE_INFO {
             unsigned long State;
    [string] WCHAR       * ServerName;
    [string] WCHAR       * ShareName;
} DFS STORAGE INFO;

typedef struct _DFS_STORAGE_INFO_1 {
             unsigned long State;
    [string] WCHAR       * ServerName;
    [string] WCHAR       * ShareName;
    DFS TARGET PRIORITY TargetPriority;
} DFS_STORAGE_INFO_1, *PDFS_STORAGE_INFO_1, *LPDFS_STORAGE_INFO_1;

typedef struct _DFSM_ROOT_LIST_ENTRY {
    [string, unique] WCHAR * ServerShare;
} DFSM_ROOT_LIST_ENTRY;

typedef struct _DFSM_ROOT_LIST {
    DWORD   cEntries;
    [size_is(cEntries)] DFSM_ROOT_LIST_ENTRY Entry[];
} DFSM_ROOT_LIST;

typedef enum {
    DFS_NAMESPACE_VERSION_ORIGIN_COMBINED = 0,
    DFS_NAMESPACE_VERSION_ORIGIN_SERVER,
    DFS NAMESPACE VERSION ORIGIN DOMAIN
} DFS_NAMESPACE_VERSION_ORIGIN;

typedef struct _DFS_SUPPORTED_NAMESPACE_VERSION_INFO {
    unsigned long     DomainDfsMajorVersion;
    unsigned long     DomainDfsMinorVersion;
```


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```
    ULONGLONG  DomainDfsCapabilities;
    unsigned long     StandaloneDfsMajorVersion;
    unsigned long     StandaloneDfsMinorVersion;
    ULONGLONG  StandaloneDfsCapabilities;
} DFS_SUPPORTED_NAMESPACE_VERSION_INFO,
 *PDFS SUPPORTED NAMESPACE VERSION INFO;

typedef struct _DFS_INFO_1 {
    [string] WCHAR *  EntryPath;
} DFS_INFO_1;

typedef struct _DFS_INFO_2 {
    [string] WCHAR *  EntryPath;
    [string] WCHAR *  Comment;
             DWORD    State;
             DWORD    NumberOfStorages;
} DFS INFO 2;

typedef struct  DFS INFO 3 {
    [string] WCHAR *  EntryPath;
    [string] WCHAR *  Comment;
             DWORD    State;
             DWORD    NumberOfStorages;
    [size_is(NumberOfStorages)] DFS_STORAGE_INFO * Storage;
} DFS_INFO_3;

typedef struct _DFS_INFO_4 {
    [string] WCHAR       * EntryPath;
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             GUID          Guid;
             DWORD         NumberOfStorages;
    [size is(NumberOfStorages)] DFS STORAGE INFO * Storage;
} DFS_INFO_4;

typedef struct _DFS_INFO_5 {
    [string] WCHAR       * EntryPath;
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             GUID          Guid;
             unsigned long PropertyFlags;
             unsigned long MetadataSize;
             DWORD         NumberOfStorages;
} DFS INFO 5;

typedef struct  DFS INFO 6 {
    [string] WCHAR       * EntryPath;
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             GUID          Guid;
             unsigned long PropertyFlags;
             unsigned long MetadataSize;
             DWORD         NumberOfStorages;
    [size is(NumberOfStorages)] DFS STORAGE INFO 1 * Storage;
} DFS_INFO_6;

typedef struct _DFS_INFO_7 {
             GUID          GenerationGuid;
} DFS_INFO_7;

typedef struct _DFS_INFO_8 {
    [string] WCHAR       * EntryPath;
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             GUID          Guid;
```


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```
            unsigned long PropertyFlags;
            unsigned long MetadataSize;
            ULONG   SecurityDescriptorLength;
            [size_is(SecurityDescriptorLength)] PUCHAR  pSecurityDescriptor;
            DWORD         NumberOfStorages;
} DFS_INFO_8,
 *LPDFS_INFO_8;

typedef struct _DFS_INFO_9 {
    [string] WCHAR       * EntryPath;
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             GUID                Guid;
             unsigned long       PropertyFlags;
             unsigned long       MetadataSize;
             ULONG   SecurityDescriptorLength;
             [size_is(SecurityDescriptorLength)] PUCHAR  pSecurityDescriptor;
             DWORD               NumberOfStorages;
             [size_is(NumberOfStorages)] LPDFS_STORAGE_INFO_1    Storage;
} DFS_INFO_9,
 *LPDFS_INFO_9;

typedef struct _DFS_INFO_50 {
             unsigned long    NamespaceMajorVersion;
             unsigned long    NamespaceMinorVersion;
             unsigned __int64 NamespaceCapabilities;
} DFS_INFO_50;

typedef struct _DFS_INFO_100 {
    [string]  WCHAR       * Comment;
} DFS_INFO_100;

typedef struct  DFS INFO 101 {
    unsigned long         State;

} DFS_INFO_101;

typedef struct _DFS_INFO_102 {
    unsigned long Timeout;
} DFS_INFO_102;

typedef struct _DFS_INFO_103 {
    unsigned long PropertyFlagMask;
    unsigned long PropertyFlags;

} DFS_INFO_103;

typedef struct _DFS_INFO_104 {
    DFS_TARGET_PRIORITY TargetPriority;
} DFS_INFO_104;

typedef struct _DFS_INFO_105 {
    [string] WCHAR       * Comment;
             DWORD         State;
             unsigned long Timeout;
             unsigned long PropertyFlagMask;
             unsigned long PropertyFlags;
} DFS INFO 105;

typedef struct _DFS_INFO_106 {
    DWORD               State;
    DFS TARGET PRIORITY TargetPriority;
} DFS_INFO_106;

typedef struct _DFS_INFO_107 {
   [string] WCHAR       * Comment;
            DWORD         State;
            unsigned long Timeout;
```


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```
            unsigned long PropertyFlagMask;
            unsigned long PropertyFlags;
            ULONG   SecurityDescriptorLength;
            [size_is(SecurityDescriptorLength)] PUCHAR  pSecurityDescriptor;
} DFS_INFO_107;

typedef struct _DFS_INFO_150 {
             ULONG   SecurityDescriptorLength;
             [size_is(SecurityDescriptorLength)] PUCHAR  pSecurityDescriptor;
} DFS_INFO_150;

typedef struct _DFS_INFO_200 {
    [string] WCHAR       * FtDfsName;
} DFS_INFO_200;

typedef struct _DFS_INFO_300 {
             DWORD   Flags;
    [string] WCHAR * DfsName;
} DFS INFO 300;

typedef [switch_type(unsigned long)] union _DFS_INFO_STRUCT {
    [case(1)]
        DFS INFO 1   * DfsInfo1;
    [case(2)]
        DFS_INFO_2   * DfsInfo2;
    [case(3)]
        DFS_INFO_3   * DfsInfo3;
    [case(4)]
        DFS INFO 4   * DfsInfo4;
    [case(5)]
        DFS INFO 5   * DfsInfo5;
    [case(6)]
        DFS_INFO_6   * DfsInfo6;
    [case(7)]
        DFS_INFO_7   * DfsInfo7;
    [case(8)]
        DFS_INFO_8   * DfsInfo8;
    [case(9)]
        DFS_INFO_9   * DfsInfo9;
    [case(50)]
        DFS_INFO_50  * DfsInfo50;
    [case(100)]
        DFS_INFO_100 * DfsInfo100;
    [case(101)]
        DFS_INFO_101 * DfsInfo101;
    [case(102)]
        DFS_INFO_102 * DfsInfo102;
    [case(103)]
        DFS_INFO_103 * DfsInfo103;
    [case(104)]
        DFS_INFO_104 * DfsInfo104;
    [case(105)]
        DFS_INFO_105 * DfsInfo105;
    [case(106)]
        DFS_INFO_106 * DfsInfo106;
    [case(107)]
        DFS INFO 107 * DfsInfo107;
    [case(150)]
        DFS INFO 150 * DfsInfo150;
    [default]
        ;
} DFS_INFO_STRUCT;


typedef struct  DFS INFO 1 CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_1 * Buffer;
} DFS_INFO_1_CONTAINER;
```


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```
typedef struct _DFS_INFO_2_CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_2 * Buffer;
} DFS_INFO_2_CONTAINER;

typedef struct  DFS INFO 3 CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_3 * Buffer;
} DFS_INFO_3_CONTAINER;

typedef struct  DFS INFO 4 CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_4 * Buffer;
} DFS_INFO_4_CONTAINER;

typedef struct _DFS_INFO_5_CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_5 * Buffer;
} DFS INFO 5 CONTAINER;

typedef struct _DFS_INFO_6_CONTAINER {
    DWORD   EntriesRead;
    [size is(EntriesRead)] DFS INFO 6 * Buffer;
} DFS_INFO_6_CONTAINER;

typedef struct _DFS_INFO_8_CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] LPDFS_INFO_8 Buffer;
} DFS INFO 8 CONTAINER,
 *LPDFS_INFO_8_CONTAINER;

typedef struct _DFS_INFO_9_CONTAINER {
    DWORD   EntriesRead;
    [size is(EntriesRead)] LPDFS INFO 9 Buffer;
} DFS_INFO_9_CONTAINER,
 *LPDFS INFO 9 CONTAINER;

typedef struct _DFS_INFO_200_CONTAINER {
    DWORD   EntriesRead;
    [size is(EntriesRead)] DFS INFO 200 * Buffer;
} DFS_INFO_200_CONTAINER;

typedef struct _DFS_INFO_300_CONTAINER {
    DWORD   EntriesRead;
    [size_is(EntriesRead)] DFS_INFO_300 * Buffer;
} DFS INFO 300 CONTAINER;

typedef struct  DFS INFO ENUM STRUCT {
    DWORD   Level;
    [switch_is(Level)] union {
        [case(1)]
            DFS INFO 1 CONTAINER   * DfsInfo1Container;
        [case(2)]
            DFS INFO 2 CONTAINER   * DfsInfo2Container;
        [case(3)]
            DFS_INFO_3_CONTAINER   * DfsInfo3Container;
        [case(4)]
            DFS_INFO_4_CONTAINER   * DfsInfo4Container;
        [case(5)]
            DFS_INFO_5_CONTAINER   * DfsInfo5Container;
        [case(6)]
            DFS_INFO_6_CONTAINER   * DfsInfo6Container;
        [case(8)]
            DFS_INFO_8_CONTAINER   * DfsInfo8Container;
        [case(9)]
            DFS_INFO_9_CONTAINER   * DfsInfo9Container;
        [case(200)]
            DFS_INFO_200_CONTAINER * DfsInfo200Container;
        [case(300)]
```


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```
            DFS_INFO_300_CONTAINER * DfsInfo300Container;
    } DfsInfoContainer;
} DFS_INFO_ENUM_STRUCT;


DWORD NetrDfsManagerGetVersion();

NET_API_STATUS NetrDfsAdd(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,string]             WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in,unique,string]      WCHAR           * Comment,
    [in]                    DWORD            Flags);

NET_API_STATUS NetrDfsRemove(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,unique,string]      WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName);

NET_API_STATUS NetrDfsSetInfo(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,unique,string]      WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in]                    DWORD             Level,
    [in,switch_is(Level)]   DFS_INFO_STRUCT * DfsInfo);

NET_API_STATUS NetrDfsGetInfo(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,unique,string]      WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in]                    DWORD             Level,
    [out,switch_is(Level)]  DFS_INFO_STRUCT * DfsInfo);

NET API STATUS NetrDfsEnum(
    [in]                    DWORD                  Level,
    [in]                    DWORD                  PrefMaxLen,
    [in,out,unique]         DFS_INFO_ENUM_STRUCT * DfsEnum,
    [in,out,unique]         DWORD                * ResumeHandle);

NET API STATUS NetrDfsMove(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,string]             WCHAR           * NewDfsEntryPath,
    [in]                    unsigned long     Flags);

void Opnum7NotUsedOnWire();

void Opnum8NotUsedOnWire();

void Opnum9NotUsedOnWire();

NET_API_STATUS NetrDfsAddFtRoot(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * DcName,
    [in,string]             WCHAR           * RootShare,
    [in,string]             WCHAR           * FtDfsName,
    [in,string]             WCHAR           * Comment,
    [in,string]             WCHAR           * ConfigDN,
    [in]                    BOOLEAN           NewFtDfs,
    [in]                    DWORD             ApiFlags,
    [in,out,unique]         DFSM_ROOT_LIST ** ppRootList);

NET_API_STATUS NetrDfsRemoveFtRoot(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * DcName,
    [in,string]             WCHAR           * RootShare,
    [in,string]             WCHAR           * FtDfsName,
    [in]                    DWORD             ApiFlags,
    [in,out,unique]         DFSM_ROOT_LIST ** ppRootList);
```


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```
NET_API_STATUS NetrDfsAddStdRoot(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * RootShare,
    [in,string]             WCHAR           * Comment,
    [in]                    DWORD             ApiFlags);

NET_API_STATUS NetrDfsRemoveStdRoot(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * RootShare,
    [in]                    DWORD             ApiFlags);

NET_API_STATUS NetrDfsManagerInitialize(
    [in,string]             WCHAR           * ServerName,
    [in]                    DWORD             Flags);

NET_API_STATUS NetrDfsAddStdRootForced(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * RootShare,
    [in,string]             WCHAR           * Comment,
    [in,string]             WCHAR           * Share);

NET_API_STATUS NetrDfsGetDcAddress(
    [in,string]             WCHAR           * ServerName,
    [in,out,string]         WCHAR          ** DcName,
    [in,out]                BOOLEAN         * IsRoot,
    [in,out]                unsigned long   * Timeout);

NET_API_STATUS NetrDfsSetDcAddress(
    [in,string]             WCHAR           * ServerName,
    [in,string]             WCHAR           * DcName,
    [in]                    DWORD             Timeout,
    [in]                    DWORD             Flags);

NET API STATUS NetrDfsFlushFtTable(
    [in,string]             WCHAR           * DcName,
    [in,string]             WCHAR           * wszFtDfsName);

NET_API_STATUS NetrDfsAdd2(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,string]             WCHAR           * DcName,
    [in,string]             WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in,unique,string]      WCHAR           * Comment,
    [in]                    DWORD             Flags,
    [in,out,unique]         DFSM_ROOT_LIST ** ppRootList);

NET_API_STATUS NetrDfsRemove2(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,string]             WCHAR           * DcName,
    [in,unique,string]      WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in,out,unique]         DFSM ROOT LIST ** ppRootList);

NET API STATUS NetrDfsEnumEx(
    [in,string]             WCHAR               * DfsEntryPath,
    [in]                    DWORD                 Level,
    [in]                    DWORD                 PrefMaxLen,
    [in,out,unique]         DFS_INFO_ENUM_STRUCT * DfsEnum,
    [in,out,unique]         DWORD               * ResumeHandle);

NET_API_STATUS NetrDfsSetInfo2(
    [in,string]             WCHAR           * DfsEntryPath,
    [in,string]             WCHAR           * DcName,
    [in,unique,string]      WCHAR           * ServerName,
    [in,unique,string]      WCHAR           * ShareName,
    [in]                    DWORD             Level,
    [in,switch_is(Level)]   DFS_INFO_STRUCT * pDfsInfo,
    [in,out,unique]         DFSM_ROOT_LIST ** ppRootList);
```


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```
NET_API_STATUS NetrDfsAddRootTarget(
    [in,unique,string]  LPWSTR  pDfsPath,
    [in,unique,string]  LPWSTR  pTargetPath,
    [in]                ULONG   MajorVersion,
    [in,unique,string]  LPWSTR  pComment,
    [in]                BOOLEAN NewNamespace,
    [in]                ULONG   Flags);

NET_API_STATUS NetrDfsRemoveRootTarget(
    [in,unique,string]  LPWSTR  pDfsPath,
    [in,unique,string]  LPWSTR  pTargetPath,
    [in]                ULONG   Flags);

NET_API_STATUS NetrDfsGetSupportedNamespaceVersion(
    [in]                DFS_NAMESPACE_VERSION_ORIGIN   Origin,
    [in,unique,string] NETDFS_SERVER_OR_DOMAIN_HANDLE pName,
    [out]               PDFS SUPPORTED NAMESPACE VERSION INFO pVersionInfo);
}
```


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7 Appendix B: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs.

Note: Some of the information in this section is subject to change because it applies to an unreleased, preliminary version of the Windows Server operating system, and thus may differ from the final version of the server software when released. All behavior notes that pertain to the unreleased, preliminary version of the Windows Server operating system contain specific references to Windows Server 2016 Technical Preview as an aid to the reader.

- Windows NT 4.0 operating system
- Windows NT Server 4.0 operating system
- Windows 2000 Server operating system
- Windows XP operating system
- Windows Server 2003 operating system
- Windows Server 2003 R2 operating system
- Windows Vista operating system
- Windows Server 2008 operating system
- Windows 7 operating system
- Windows Server 2008 R2 operating system
- Windows 8 operating system
- Windows Server 2012 operating system
- Windows 8.1 operating system
- Windows Server 2012 R2 operating system
- Windows 10 operating system
- Windows Server 2016 Technical Preview operating system

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

<1> Section 1.3: Windows NT Server 4.0 supports only stand-alone DFS namespaces.

<2> Section 1.5: Windows relies on manual coordination between human operators to ensure that only one DFS metadata modification is in progress at any time.

<3> Section 1.7: The Windows RPC Protocol returns RPC_S_PROCNUM_OUT_OF_RANGE to notify the client that an RPC method is out of range, as specified in [MS-RPCE].

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<4> Section 2.2.2.12: Only Windows Server 2008, Windows Server 2008 R2 operating system, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support ABDE mode.

<5> Section 2.2.3.5: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support ABDE mode.

<6> Section 2.2.3.7: Windows servers return a null GUID for stand-alone DFS namespaces.

<7> Section 2.2.3.10: This level is supported only in Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

To identify the DFS metadata format in use, two mandatory attributes are defined in the schema to hold the major version (ldapDisplayName = msDFS-SchemaMajorVersion) and minor version (ldapDisplayName = msDFS-SchemaMinorVersion) numbers. The **rangeUpper** attribute in the attribute schema for these version number attributes determines the format of the DFS metadata supported in the forest. The value of these attributes determines the DFS metadata format in use for an existing DFS namespace. The implementation of a domainv2-based DFS namespace has rangeUpper=2, rangeLower=2 for the NamespaceMajorVersion; and rangeUpper=0, rangeLower=0 for the NamespaceMinorVersion.

A change to an existing, or the addition of a new, mandatory attribute increments the major version and sets the minor version to 0. A change to an existing, or the addition of a new, optional attribute increments the minor version without changing the major version.

The NamespaceMajorVersion and NamespaceMinorVersion determine the format of the DFS metadata supported in the forest. The following table applies only to Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

	NamespaceMajorVersion	NamespaceMinorVersion
Domainv1-based DFS	1	1
Domainv2-based DFS	2	0
Stand-alone DFS	1	2

<8> Section 2.2.3.10: This level is supported only in Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview .

To identify the DFS metadata format in use, two mandatory attributes are defined in the schema to hold the major version (ldapDisplayName = msDFS-SchemaMajorVersion) and minor version (ldapDisplayName = msDFS-SchemaMinorVersion) numbers. The **rangeUpper** attribute in the attribute schema for these version number attributes determines the format of the DFS metadata supported in the **forest**. The value of these attributes determines the DFS metadata format in use for an existing DFS namespace. The implementation of a domainv2-based DFS namespace has rangeUpper=2, rangeLower=2 for the NamespaceMajorVersion and rangeUpper=0, rangeLower=0 for the NamespaceMinorVersion.

A change to an existing, or the addition of a new, mandatory attribute increments the major version and sets the minor version to 0. A change to an existing, or the addition of a new, optional attribute increments the minor version without changing the major version.

The NamespaceMajorVersion and NamespaceMinorVersion determine the format of the DFS metadata supported in the forest. The following table applies only to Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

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	NamespaceMajorVersion	NamespaceMinorVersion
Domainv1-based DFS	1	1
Domainv2-based DFS	2	0
Stand-alone DFS	1	2

<9> Section 2.2.3.10: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support ABDE mode.

<10> Section 2.2.4.3: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support ABDE mode.

<11> Section 2.3.3.1.1: Windows 2000 Server performs a case-sensitive comparison of the name. Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview perform a case-insensitive comparison of the name.

<12> Section 2.3.3.1.1.2: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview use the same name for the **ShortPrefix** field and the **Prefix** field. Windows 2000 Server stores an 8.3 name in the **ShortPrefix** field.

<13> Section 2.3.3.1.1.2: Only Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support DFS referral site costing.

<14> Section 2.3.3.1.1.2: Only Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support DFS root scalability mode.

<15> Section 2.3.3.1.1.2: Only Windows Server 2003 operating system with Service Pack 1 (SP1), Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support DFS client target failback.

<16> Section 2.3.3.1.1.3.1: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview always set this field to 0x00000002. Windows 2000 Server sets this field to 0x00000001 for DFS root targets and to 0x00000002 for DFS link targets.

<17> Section 2.3.3.1.1.4: Only Windows 2000 Server uses the SiteInformationBLOB. Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview preserve this BLOB if it already exists. When creating a new DFS namespace, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview create this BLOB with a **SiteEntryCount** of 0 and do not create any SiteEntryBLOBs.

<18> Section 2.3.3.1.1.4: Windows 2000 Server determines the site of a DFS root target or a DFS link target when it is added to a domain-based DFS namespace, and stores the target in this BLOB. The **NetrDfsManagerReportSiteInfo** method, as specified in [MS-SRVS], is issued to the DFS root target server or the DFS link target server that were added to determine the site information.

<19> Section 2.3.4.2: Windows does not preserve unrecognized values.

<20> Section 2.3.4.2: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support Domainv2.

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<21> Section 2.3.4.2: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support Domainv2.

<22> Section 2.3.4.2: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support Domainv2.

<23> Section 2.3.4.3: Windows does not preserve unrecognized values.

<24> Section 2.3.4.3: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support Domainv2.

<25> Section 2.3.4.3: Only Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support Domainv2.

<26> Section 3.1.1: Windows 2000 Server, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview cache the DFS metadata as an optimization.

<27> Section 3.1.3: Windows 2000 Server, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview determine the PDC for the domain and initialize the PDCRoleHolder.

<28> Section 3.1.3: Windows 2000 Server, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview cache the DFS metadata as an optimization.

<29> Section 3.1.4: Windows uses only the error code values, as specified in [MS-ERREF].

<30> Section 3.1.4: This method is not supported in Windows NT Server 4.0 and Windows 2000 Server.

<31> Section 3.1.4: This method is supported only in Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<32> Section 3.1.4: This method is supported only in Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<33> Section 3.1.4: This method is supported only in Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<34> Section 3.1.4: For historical reasons, Windows 2000 Server uses method opnums 7, 8, and 9 for local RPC calls to itself. These methods are never called over the network by Windows clients or servers (to another server).

Opnums reserved for local use apply to Windows as follows: opnums 7-9 are only used locally, never remotely, by Windows 2000 Server and not by any other Windows version.

<35> Section 3.1.4.1.1: This method is not implemented in Windows NT Server 4.0.

<36> Section 3.1.4.1.1: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview return ERROR_NOT_SUPPORTED (0x00000032).

<37> Section 3.1.4.1.2: The following table gives the return value of NetrDfsManagerGetVersion for different versions of Windows.

Windows Version	Return Value
Windows NT Server 4.0	0x00000001
Windows 2000 Server	0x00000002

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Windows Version	Return Value
Windows Server 2003	0x00000004
Windows Server 2008	0x00000006
Windows Server 2008 R2	0x00000006
Windows Server 2012	0x00000006
Windows Server 2012 R2	0x00000006
Windows Server 2016 Technical Preview	0x00000006

<38> Section 3.1.4.1.2: The RPC interface version has remained constant since Windows NT Server 4.0. Windows 2000 Server adds new methods to the same RPC interface. Also, Windows 2000 Server supports hosting of at most one DFS namespace. Hence, applications could potentially handle version differences by using the returned version information.

<39> Section 3.1.4.1.2: A Windows NT Server 4.0 can host at most one DFS namespace. Windows Server 2003, except for Windows Server 2003 Standard Edition operating system, supports hosting of more than one DFS namespace per server. In default configurations, Windows Server 2003 Standard Edition supports hosting of at most one DFS namespace per server.

<40> Section 3.1.4.1.2: Windows clients use the returned value to determine when to call NetrDfsEnum versus NetrDfsEnumEx. For more information, see section 3.2.4.1.4.

<41> Section 3.1.4.1.2: Windows Server 2003 with SP1, Windows Server 2003 operating system with Service Pack 2 (SP2), Windows Server 2003 R2, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview support NetrDfsMove (Opnum 6).

<42> Section 3.1.4.1.3: Windows 2000 Server does not support a domain-based DFS namespace in the NetrDfsAdd method.

<43> Section 3.1.4.1.3: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not verify whether link targets exist. Windows 2000 operating system and Windows NT 4.0 do verify whether link targets exist unless DFS_RESTORE_VOLUME is specified.

<44> Section 3.1.4.1.3: Windows 2000 and Windows NT 4.0 do use this test.

<45> Section 3.1.4.1.3: Windows 2000 Server requires that the *DFS_ADD_VOLUME* flags parameter be specified when a new link is being created; Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not require this.

Windows servers check whether a folder or a file that has the same name as the link appears in the **object store** under the root and take the following actions:

- If no folder or file exists, create the link folder.
- If an empty folder with the same name as the link exists, do not create a new link folder.
- If a non-empty folder or a file with the same name as the link exists, rename the non-empty folder or the file to DFS.*GUIDLinkName*, and create a new link folder. An example of a renamed non-empty folder or file is DFS.cf13c05f-5c10-4879-9acb-04ced8f46c7aTemplates, where cf13c05f-5c10-4879-9acb-04ced8f46c7a is the *GUID* and Templates is the *LinkName*.

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- Set the reparse point to the leaf folder of the link path. For example, if the link path is HR\Documents, set the reparse point to the Documents folder.

<46> Section 3.1.4.1.3: The **msDFS-Commentv2** field in the Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview metadata is updated with the value that is passed on as input.

<47> Section 3.1.4.1.3: NetrDfsAdd in Windows 2000 Server supports only a stand-alone DFS namespace. Windows 2000 Server returns ERROR_NOT_SUPPORTED (0x00000032) if NetrDfsAdd is called on a domain-based DFS namespace.

<48> Section 3.1.4.1.3: In Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview, NetrDfsAdd supports both stand-alone and domain-based DFS namespaces.

<49> Section 3.1.4.1.4: Windows 2000 Server does not support a domain-based DFS namespace in the NetrDfsRemove method.

<50> Section 3.1.4.1.4: This method does not support domain-based DFS namespaces in Windows 2000 Server; NetrDfsRemove2 is used instead. Windows 2000 Server will return ERROR_NOT_SUPPORTED (0x00000032) if NetrDfsRemove is called on a domain-based DFS namespace.

<51> Section 3.1.4.1.4: In Windows Server 2003, the NetrDfsRemove method is functionally equivalent to NetrDfsRemove2.

<52> Section 3.1.4.1.5: Windows 2000, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview allow the target state of a root target or a link target to be set to either DFS_STORAGE_STATE_ONLINE or DFS_STORAGE_STATE_OFFLINE. Windows Server 2003 does not allow the target state of a root target to be set to DFS_STORAGE_STATE_OFFLINE.

Windows 2000 Server does not support DFS_VOLUME_STATE_RESYNCHRONIZE for the **State** field of DFS_INFO_101 for a **Level** parameter value of 101.

<53> Section 3.1.4.1.5: Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview allow setting the target state of a root target or a link target to either DFS_STORAGE_STATE_ONLINE or DFS_STORAGE_STATE_OFFLINE. Windows Server 2003 does not allow setting the target state of a root target to DFS_STORAGE_STATE_OFFLINE.

<54> Section 3.1.4.1.5: A *Level* value of 102 is not supported on Windows NT Server 4.0.

Level parameter values 103-106 are not supported on Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003 RTM.

Level parameter values 107 and 150 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003.

<55> Section 3.1.4.1.5: On Windows NT Server 4.0 and Windows 2000 Server, the server returns error code ERROR_INVALID_LEVEL.

<56> Section 3.1.4.1.5: Windows 2000 Server does not support a domain-based DFS namespace in the NetrDfsSetInfo method.

<57> Section 3.1.4.1.5: The NetrDfsSetInfo method supports only the stand-alone DFS namespace on Windows 2000 Server. NetrDfsSetInfo supports both stand-alone and domain-based DFS namespaces on Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview. *Level* parameter values 103, 104, 105, and 106 are valid only on Windows Server 2003 with SP1, Windows Server

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2003 SP2, Windows Server 2003 R2, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview. *Level* parameter values 107 and 150 are supported only on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<58> Section 3.1.4.1.6: This level is supported only on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<59> Section 3.1.4.1.6: Level 4 is not supported in Windows NT Server 4.0.

Levels 5, 6, and 7 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003 RTM. Level 7 is supported for domain-based DFS only. It is used to determine whether the DFS metadata of the namespace has changed.

Level 50 and 150 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003.

<60> Section 3.1.4.1.6: On Windows NT Server 4.0 and Windows 2000 Server, the server returns error code ERROR_INVALID_LEVEL.

<61> Section 3.1.4.1.6: For a stand-alone namespace in Windows, metadata size is the sum of the following:

- Size of the name of all the keys in the namespace (all keys under the DFS root key in registry)
- Size of the values under each key
- Size of the data of each value

<62> Section 3.1.4.1.7: Level 4 is not supported in Windows NT Server 4.0.

Levels 5 and 6 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003 RTM.

Levels 8 and 9 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003.

Level 200 is not supported in Windows NT Server 4.0 and is only valid on a domain controller (DC).

Level 300 is not supported in Windows NT Server 4.0, or Windows 2000 Server.

<63> Section 3.1.4.1.7: On Windows NT Server 4.0 and Windows 2000 Server, the server returns error code ERROR_INVALID_LEVEL.

<64> Section 3.1.4.1.7: On return, the DfsEnum's **DfsInfoContainer** member contains an array of information structures specific to the *Level* requested by the caller. In Windows 2000 Server, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2, the number of entries to return in the enumeration is calculated by dividing *PrefMaxLen* by the size of the **Level**-specific information structure, using integer division. If the result is zero, one entry is returned.

This calculation is performed on the server by using the native size of the specified information structure on the server's architecture. As all of the **Level**-specific information structures contain pointers, such as the **DFS_INFO_1 EntryPath** member, this condition has an important effect. Because the size of a pointer on a 32-bit architecture differs as compared to a 64-bit architecture, the returned number of entries may be higher or lower than that implied by the native architecture of the client, depending on the native architecture of the server.

<65> Section 3.1.4.1.7: Windows servers use the *ResumeHandle* parameter as an index into the collection of enumerable items. Due to intervening or concurrent updates, a resumed enumeration may return non-unique or incomplete results.

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<66> Section 3.1.4.1.7: This method is supported only by Windows NT Server 4.0, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

<67> Section 3.1.4.1.7: The NetrDfsEnum method is used only with Windows 2000 Server because there is no parameter to specify the name of a DFS namespace. In Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2, the DFS server can successfully process this method if it is hosting only one DFS namespace root target.

<68> Section 3.1.4.1.8: Windows Server 2003 with SP1, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not allow the following:

- The Unicode code points 0x0000 through 0x001F, 0x0022 ("), 0x002A (*), 0x002F (/), 0x003A (:), 0x003C, (<), 0x003E (>), 0x003F (?), or 0x007C (|).
- The relative path elements "." or "..".

<69> Section 3.1.4.1.8: Windows servers perform DFS link move operations atomically for domainv1-based DFS namespaces. Move operations in stand-alone DFS namespaces and domainv2-based DFS namespaces are not atomic.

<70> Section 3.1.4.1.8: If there is a conflict between an existing file and a pathname component in the destination path or DFS link of a move operation, Windows servers rename the existing file by appending a ".{GUID}" to the file name, where "{GUID}" is a newly generated GUID.

<71> Section 3.1.4.1.8: Windows servers remove intermediate directories in the pathname of a source DFS link if they are empty.

<72> Section 3.1.4.1.8: This method is supported only on Windows Server 2003 with SP1, Windows Server 2003 SP2, Windows Server 2003 R2, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<73> Section 3.1.4.1.9: This method is supported only on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<74> Section 3.1.4.1.10: This method is supported only on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<75> Section 3.1.4.1.10: Windows does not fail calls that specify reserved bits.

<76> Section 3.1.4.1.10: Windows does not support DFS_FORCE_REMOVE on member servers.

<77> Section 3.1.4.1.10: Windows removes local information related to the root.

<78> Section 3.1.4.1.11: This method is supported only on Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<79> Section 3.1.4.2.1: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 ignore the *DcName* parameter.

<80> Section 3.1.4.2.1: The *ppRootList* parameter is not referenced in Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2. On success in Windows 2000, the RPC call returns a list of the remaining root targets of the DFS namespace .

To support down-level compatibility with Windows 2000, Windows clients issue a NetrDfsSetDcAddress to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

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<81> Section 3.1.4.2.1: This method is supported only by Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

<82> Section 3.1.4.2.1: This method supports both stand-alone DFS namespaces and domain-based DFS namespaces in Windows 2000 Server, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

The DFS_RESTORE_VOLUME bit of the *Flags* parameter is used only with Windows 2000 Server.

Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 ignore the *DcName* and *ppRootList* parameters.

To support down-level compatibility with Windows 2000 Server, Windows clients issue NetrDfsSetDcAddress to each root target listed in *ppRootList*. NetrDfsSetDcAddress specifies the name of the PDC that is used for the *DcName* parameter, and the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter. NetrDfsSetDcAddress also specifies a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<83> Section 3.1.4.2.1: Windows NT Server 4.0 does not support this method.

<84> Section 3.1.4.2.1: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 do not verify whether link targets exist. Windows 2000 Server and Windows NT 4.0 do verify whether link targets exist, unless DFS_RESTORE_VOLUME is specified.

<85> Section 3.1.4.2.1: Windows 2000 Server and Windows NT 4.0 do use this test.

<86> Section 3.1.4.2.1: Windows 2000 Server requires that the *DFS_ADD_VOLUME Flags* parameter be specified when creating a new link; Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 do not.

Windows servers check whether a folder or a file that has the same name as the link appears in the object store under the root and take the following actions:

- If no folder or file exists, create the link folder.
- If an empty folder with the same name as the link exists, do not create a new link folder.
- If a non-empty folder or a file with the same name as the link exists, rename the non-empty folder or the file to DFS.*GUIDLinkName*, and create a new link folder. An example of a renamed non-empty folder or file is DFS.cf13c05f-5c10-4879-9acb-04ced8f46c7aTemplates, where cf13c05f-5c10-4879-9acb-04ced8f46c7a is the *GUID* and Templates is the *LinkName*.
- Set the reparse point to the leaf folder of the link path. For example, if the link path is HR\Documents, set the reparse point to the Documents folder.

<87> Section 3.1.4.2.2: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 ignore the *DcName* parameter.

<88> Section 3.1.4.2.2: The *ppRootList* parameter is not referenced in Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2. In Windows 2000, a list of remaining root targets of the DFS namespace is returned when the RPC call succeeds.

To support down-level compatibility with Windows 2000, Windows clients issue a NetrDfsSetDcAddress to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<89> Section 3.1.4.2.2: This method is supported only by Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

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<90> Section 3.1.4.2.2: This method supports both stand-alone DFS namespaces and domain-based DFS namespaces in Windows 2000 Server, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

The *ppRootList* parameter is not used in Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

To support down-level compatibility with Windows 2000 Server, Windows clients issue a NetrDfsSetDcAddress to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<91> Section 3.1.4.2.2: Windows NT Server 4.0 does not support this method.

<92> Section 3.1.4.2.3: While Windows 2000 Server can host at most one root target, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview can host more than one root target on the same server. This precludes meaningful use of the NetrDfsEnum method by Windows Server 2003 and Windows Server 2008 because NetrDfsEnum does not have a parameter to specify the DFS namespace of interest. Hence, the NetrDfsEnumEx method is used on Windows Server 2003 and Windows Server 2008.

<93> Section 3.1.4.2.3: Windows NT Server 4.0 does not support the NetrDfsEnumEx method.

<94> Section 3.1.4.2.3: Level 4 is not supported in Windows NT Server 4.0.

Levels 5 and 6 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003.

Levels 8 and 9 are not supported in Windows NT Server 4.0, Windows 2000 Server, or Windows Server 2003.

Level 200 is not supported in Windows NT Server 4.0, and it is only valid on a domain controller (DC).

Level 300 is not supported in Windows NT Server 4.0 or Windows 2000 Server.

<95> Section 3.1.4.2.3: On Windows NT Server 4.0 and Windows 2000 Server, the server returns error code ERROR_INVALID_LEVEL.

<96> Section 3.1.4.2.3: On return, the DfsEnum's **DfsInfoContainer** member contains an array of information structures specific to the *Level* requested by the caller. In Windows 2000 Server, Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview, the number of entries to return in the enumeration is calculated by dividing *PrefMaxLen* by the size of the **Level**-specific information structure, using integer division. If the result is zero, one entry is returned.

This calculation is performed on the server by using the native size of the given information structure on the server's architecture. As all of the **Level** specific information structures contain pointers, such as the **DFS_INFO_1 EntryPath** member, this condition has an important effect. Because the size of a pointer on a 32-bit architecture differs as compared to a 64-bit architecture, the returned number of entries may be higher or lower than that implied by the native architecture of the client, depending on the native architecture of the server.

<97> Section 3.1.4.2.3: Windows servers use the *ResumeHandle* parameter as an index into the collection of enumerable items. Due to intervening or concurrent updates, a resumed enumeration may return non-unique or incomplete results.

<98> Section 3.1.4.2.3: To be backward-compatible with the NetrDfsEnum method, in this case the NetrDfsEnumEx method in Windows Server 2003, Windows Server 2008, Windows Server 2008 R2,

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Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview ignores the <ServerName> in *DfsEntryPath* and returns the required information for the specified Level based on the namespace it hosts.

The NetrDfsEnum method is used only with Windows 2000 Server because there is no parameter to specify the name of a DFS namespace. In Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview, the DFS server can successfully process this method if it is hosting only one DFS namespace root target.

<99> Section 3.1.4.2.4: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 ignore the *DcName* parameter.

<100> Section 3.1.4.2.4: Windows 2000, Windows Server 2008, and Windows Server 2008 R2 allow the target state of a root target or a link target to be set to either DFS_STORAGE_STATE_ONLINE or to DFS_STORAGE_STATE_OFFLINE. Windows Server 2003 does not allow the target state of a root target to be set to DFS_STORAGE_STATE_OFFLINE.

Windows 2000 Server does not support DFS_VOLUME_STATE_RESYNCHRONIZE for the **State** field of DFS_INFO_101 for a *Level* parameter value of 101.

<101> Section 3.1.4.2.4: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 allows the target state of a root target or a link target to be set to either DFS_STORAGE_STATE_ONLINE or to DFS_STORAGE_STATE_OFFLINE. Windows Server 2003 does not allow the target state of a root target to be set to DFS_STORAGE_STATE_OFFLINE.

<102> Section 3.1.4.2.4: Level 102 is not supported in Windows NT Server 4.0.

Levels 103-106 are not supported in Windows NT Server 4.0, Windows 2000 Server or Windows Server 2003 RTM.

Levels 107 and 150 are not supported in Windows NT Server 4.0, Windows 2000 Server or Windows Server 2003.

<103> Section 3.1.4.2.4: On Windows NT Server 4.0 and Windows 2000 Server, the server returns error code ERROR_INVALID_LEVEL.

<104> Section 3.1.4.2.4: The *ppRootList* parameter is not referenced in Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2. In Windows 2000, a list of remaining root targets of the DFS namespace is returned when the RPC call succeeds.

To support down-level compatibility with Windows 2000, Windows clients issue a NetrDfsSetDcAddress to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<105> Section 3.1.4.2.4: This method is supported only on Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

<106> Section 3.1.4.2.4: Windows 2000, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 support both stand-alone and domain-based DFS namespaces for NetrDfsSetInfo2 (Opnum 22).

<107> Section 3.1.4.2.4: Windows NT Server 4.0 does not support this method.

<108> Section 3.1.4.3.1: Windows 2000, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview ignore this parameter and use the local **NetBIOS host name** instead.

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<109> Section 3.1.4.3.1: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview ignore the *ConfigDN* parameter.

<110> Section 3.1.4.3.1: No information is returned through the *ppRootList* parameter on Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

To support down-level compatibility with Windows 2000 Server, Windows clients issue a NetrDfsSetDcAddress (Opnum 17) method to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

Windows NT Server 4.0 does not support this method.

<111> Section 3.1.4.3.1: No information is returned through the *ppRootList* parameter on Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview. To support down-level compatibility with Windows 2000, Windows clients issue a NetrDfsSetDcAddress (Opnum 17) method to each root target listed in *ppRootList* specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and the NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the **Timeout** parameter. Windows NT 4.0 does not support this method.

<112> Section 3.1.4.3.2: Windows NT Server 4.0 does not support the NetrDfsRemoveFtRoot method.

<113> Section 3.1.4.3.2: Windows does not fail calls that specify reserved bits.

<114> Section 3.1.4.3.2: The *ppRootList* parameter is not referenced on Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview. On Windows 2000, a list of remaining root targets of the DFS namespace is returned when the RPC call succeeds.

To support down-level compatibility with Windows 2000, Windows clients issue a NetrDfsSetDcAddress (Opnum 17) to each root target listed in *ppRootList* by specifying the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<115> Section 3.1.4.3.2: Windows does not support DFS_FORCE_REMOVE on member servers.

<116> Section 3.1.4.3.2: Windows does remove local information related to the root.

<117> Section 3.1.4.3.2: Windows servers do not remove the object of a domain-based DFS namespace if the last DFS root target is being removed. Windows clients remove the object of the DFS namespace on successful return from this method.

<118> Section 3.1.4.4.1: The NetrDfsAddStdRoot (Opnum 12) method can also be used for clustered DFS with Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview.

<119> Section 3.1.4.4.1: Windows NT Server 4.0 does not support this method.

<120> Section 3.1.4.4.1: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 return this error code for the described condition.

<121> Section 3.1.4.4.1: Windows 2000 returns this error code for the described condition.

<122> Section 3.1.4.4.2: Windows NT Server 4.0 does not support the NetrDfsRemoveStdRoot method.

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<123> Section 3.1.4.4.3: The NetrDfsAddStdRootForced method is used to create a clustered DFS namespace in Windows 2000 Server. This call allows an offline share to host the DFS root.

<124> Section 3.1.4.4.3: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not support the NetrDfsAddStdRootForced method. Use the NetrDfsAddStdRoot (Opnum 12) method instead.

<125> Section 3.1.4.4.3: Windows NT Server 4.0 does not support the NetrDfsAddStdRootForced (Opnum 15) method.

<126> Section 3.1.4.5.1: Windows NT Server 4.0 does not support the NetrDfsGetDcAddress method.

<127> Section 3.1.4.5.1: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 ignore the *ServerName* parameter.

<128> Section 3.1.4.5.1: Windows clients ignore the value returned in the *DcName* parameter; Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 return a blank name.

<129> Section 3.1.4.5.1: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 always return FALSE in the *IsRoot* parameter. While Windows Server 2003 Standard Edition supports the ability to host only one DFS namespace, it returns FALSE in the *IsRoot* parameter even when it is hosting a DFS namespace.

The client-side wrapper of the NetrDfsAddFtRoot (Opnum 10) RPC method in Windows 2000 Server, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, and Windows Server 2008 R2 uses the NetrDfsGetDcAddress method to determine whether the server to which the RPC is to be issued is already hosting a DFS namespace. If the value returned in the *IsRoot* parameter is TRUE, the NetrDfsAddFtRoot () method fails at the client. This is meant for Windows 2000 Server, which supports the ability to host at most one DFS namespace. This is why Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 always return FALSE for the *IsRoot* parameter.

<130> Section 3.1.4.5.1: In Windows 2000 Server, the default time-out value is 2 hours. This value can be overridden by calling NetrDfsSetDcAddress (Opnum 17).

<131> Section 3.1.4.5.1: This method is supported only by Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

<132> Section 3.1.4.5.2: Windows NT Server 4.0 does not support the NetrDfsSetDcAddress method.

<133> Section 3.1.4.5.2: Windows does not fail the call if reserved bits are specified.

<134> Section 3.1.4.5.2: Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2 implement it as a method with no effect that returns ERROR_SUCCESS. Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not implement this method.

<135> Section 3.1.4.5.2: To support down-level compatibility with Windows 2000 Server, Windows clients issue a NetrDfsSetDcAddress (Opnum 17) to each DFS root target returned in the *ppRootList* parameter from an invocation of NetrDfsAdd2 (Opnum 19), NetrDfsRemove2 (Opnum 20), NetrDfsSetInfo2 (Opnum 22), NetrDfsAddFtRoot (Opnum 10), or NetrDfsRemoveFtRoot (Opnum 11) methods. NetrDfsSetDcAddress (Opnum 17) specifies the name of the PDC used for the *DcName* parameter, the NET_DFS_SETDC_INIT_PKT and the NET_DFS_SETDC_TIMEOUT flags for the *Flags* parameter, and a value of 0x00001C20 (7,200 seconds or 2 hours) for the *Timeout* parameter.

<136> Section 3.2.3: Windows 2000, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview clients create a separate binding for every method invocation.

<137> Section 3.2.4.1.1: Windows NT 4.0 and Windows 2000 Server never reissue the NetrDfsAdd2 method.

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<138> Section 3.2.4.1.2: Windows NT 4.0 and Windows 2000 Server never reissue the NetrDfsRemove2 method.

<139> Section 3.2.4.1.3: Windows NT 4.0 and Windows 2000 Server never reissue the NetrDfsSetInfo2 method.

<140> Section 3.2.4.1.4: For level values other than 200, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10 and Windows Server 2016 Technical Preview clients first call the NetrDfsManagerGetVersion method. If the returned version value is 0x00000004 or greater, the client calls the NetrDfsEnumEx method. If the returned version value is less than 0x00000004, the client calls the NetrDfsEnum method. For level 200, Windows XP, Windows Server 2003, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10 and Windows Server 2016 Technical Preview clients always call the NetrDfsEnumEx method on the PDC.

<141> Section 3.2.4.1.4: The Windows 2000 Server client does not call either NetrDfsEnum or NetrDfsEnumEx for level 200; rather, it determines the list of domain-based DFS namespaces through an LDAP query directly on the DFS configuration container.

<142> Section 3.2.4.1.4: Windows clients rely on human operators to detect inconsistent results in displayed output and to request a new enumeration.

<143> Section 3.2.4.3.1: Only Windows 2000 Server returns other existing DFS root targets of the DFS namespace in the *ppRootList* parameter. Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not return any information in the *ppRootList* parameter.

<144> Section 3.2.4.3.1: Windows clients fail the NetrDfsAddFtRoot operation on the client if an IP address is given as the *ServerName* parameter. This is because Windows clients attempt to use the *ServerName* parameter as the security principal when updating the ACL of the object of a domain-based DFS namespace. Because **AD** does not permit an IP address to be used as a security principal, a Windows client will fail on the ACL update before sending the NetrDfsAddFtRoot request message.

<145> Section 3.2.4.3.2: Windows NT Server 4.0 does not support the NetrDfsRemoveFtRoot method.

<146> Section 3.2.4.3.2: Only Windows 2000 Server returns other existing DFS root targets of the DFS namespace in the *ppRootList* parameter. Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not return any information in the *ppRootList* parameter.

<147> Section 3.3.4: Windows allows DCs to be DFS root targets.

<148> Section 3.3.4.2.1: Level parameter value 200 is not supported in Windows NT 4.0 and only valid on a domain controller (DC).

<149> Section 3.3.4.3.2: Windows Server 2003, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016 Technical Preview do not support this method and will fail with ERROR_NOT_SUPPORTED (0x00000032).

On a successful call to the NetrDfsAddFtRoot or NetrDfsRemoveFtRoot methods, Windows clients call the NetrDfsFlushFtTable method on the PDC of the domain of the DFS root target server. For more information, see sections 3.2.4.3.1 and 3.2.4.3.2.

This method is not supported on Windows NT Server 4.0.

<150> Section 5.1: Windows servers use the RPC Protocol to retrieve the identity of the caller, as specified in [MS-RPCE] section 3.3.3.4.3. The server uses the underlying Windows security subsystem

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to determine the permissions for the caller. If the caller does not have the required permissions to execute a specific method, the method call fails with ERROR_ACCESS_DENIED (0x00000005).

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8 Appendix C: XML Schema of XML Document Stored in msDFS-TargetListv2 Attribute

For more information about XML and XML schemas, see [XML] and [XMLSCHEMA], respectively.

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
            xmlns="http://schemas.microsoft.com/dfs/2007/03"
            targetNamespace="http://schemas.microsoft.com/dfs/2007/03"
            elementFormDefault="qualified">
  <xsd:annotation>
    <xsd:documentation xml:lang="en">
      Schema document for DFS targets (root or link) for use by the
      domainV2 code in the DFS service. An XML document conforming
      to this schema is stored as the value of an attribute of the
      LDAP entry corresponding to a DFS namespace root or DFS link
      and contains the information on the targets of that DFS
      namespace root or DFS link.

      Conventions:
      - There is a target namespace for this schema document.
          This means instances instances must also declare the same
          namespace for them to be validated using this schema.
      - The elementFormDefault attribute is set to qualified so
          that an instance conforming to this schema can set this
          schema document's namespace as its default namespace and
          have all all unqualified element-type names be considered
          part of the default namespace.
      - Data are in elements, metadata in attributes.

    </xsd:documentation>
  </xsd:annotation>

  <xsd:attributeGroup name="VersionGroup">
     <xsd:attribute name="majorVersion" use="required">
      <xsd:simpleType>
        <xsd:restriction base="xsd:unsignedByte">
          <xsd:minInclusive value="2"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
    <xsd:attribute name="minorVersion" type="xsd:unsignedByte"
                   use="required"/>

  </xsd:attributeGroup>

  <xsd:simpleType name="TargetStateType">
    <xsd:annotation>
      <xsd:documentation xml:lang="en">
        Type used for specifying the state of a target.

        This is global to support extension or redefinition.
      </xsd:documentation>
    </xsd:annotation>
    <xsd:restriction base="xsd:token">
      <xsd:enumeration value="online"/>
      <xsd:enumeration value="offline"/>
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:simpleType name="TargetPriorityClassType">
    <xsd:annotation>
      <xsd:documentation xml:lang="en">
        Type used for specifying the priority class of a target.

        This is global to support extension or redefinition.
      </xsd:documentation>
    </xsd:annotation>
```


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```
  <xsd:restriction base="xsd:token">
    <xsd:enumeration value="siteCostNormal"/>
    <xsd:enumeration value="globalHigh"/>
    <xsd:enumeration value="siteCostHigh"/>
    <xsd:enumeration value="siteCostLow"/>
    <xsd:enumeration value="globalLow"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="TargetPriorityRankType">
  <xsd:annotation>
    <xsd:documentation xml:lang="en">
      Type used for specifying the priority rank of a target.

      This is global to support extension or redefinition.
    </xsd:documentation>
  </xsd:annotation>
  <xsd:restriction base="xsd:unsignedByte">
    <xsd:maxInclusive value="31"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:element name="targets">
  <xsd:complexType>

    <xsd:sequence>

      <xsd:element name="target" maxOccurs="unbounded">
        <xsd:complexType>
          <xsd:annotation>
            <xsd:documentation xml:lang="en">
              This is an anonymous complex type with simple content:
              i.e. it allows character data only with no children.
              Of course, attributes are allowed.

              A pattern restriction is used to ensure a UNC path.
              Pathname components cannot have embedded forward
              slashes (/).
            </xsd:documentation>
          </xsd:annotation>

          <xsd:simpleContent>
            <xsd:restriction base="xsd:anyType">
              <xsd:simpleType>
                <xsd:restriction base="xsd:string">
                  <xsd:pattern
                       value="\\\\([^/\\])+(\\([^/\\])+)+(\\)?"/>
                </xsd:restriction>
              </xsd:simpleType>

              <xsd:attribute name="state" type="TargetStateType"
                             default="online"/>
              <xsd:attribute name="priorityClass"
                             type="TargetPriorityClassType"
                             default="siteCostNormal"/>
              <xsd:attribute name="priorityRank"
                             type="TargetPriorityRankType"
                             default="0"/>

            </xsd:restriction>

          </xsd:simpleContent>

        </xsd:complexType>
      </xsd:element>

    </xsd:sequence>

    <xsd:attributeGroup ref="VersionGroup"/>
```


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```
      <xsd:attribute name="targetCount" use="required">
        <xsd:simpleType>
          <xsd:restriction base="xsd:unsignedInt">
            <xsd:minInclusive value="1"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:attribute>

      <xsd:attribute name="totalStringLengthInBytes"
                     type="xsd:unsignedInt" use="required">
        <xsd:annotation>
          <xsd:documentation>
            To permit a single-pass parsing, this attribute contains
            the length (in bytes) of all strings (including NULL
            termination) that will be retained in that form in an
            in-memory representation.
          </xsd:documentation>
        </xsd:annotation>
      </xsd:attribute>

    </xsd:complexType>
  </xsd:element>

</xsd:schema>

<!-- Editor settings. DO NOT delete -->
<!-- vi: set ts=2 sw=2 filetype=xml: -->
```


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9 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- The removal of a document from the documentation set.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the technical content of the document is identical to the last released version.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.
- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

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- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
7 Appendix B: Product Behavior	Added Windows 10 to applicability list.	Y	Content update.
7 Appendix B: Product Behavior	Updated product behavior notes for Windows 10 and Windows Server 2016 Technical Preview.	Y	Product behavior note updated.

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