

How Active Directory Functional Levels Work

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Different Active Directory features are available at different functional levels. Raising domain and forest functional levels is required to enable certain new features as domain controllers are upgraded from Windows NT 4.0 and Windows 2000 to Windows Server 2003. Even for a new installation of Windows Server 2003 Active Directory (as opposed to an upgrade), an administrator must raise functional levels to obtain the full capabilities of Windows Server 2003 Active Directory.

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The Architecture of Active Directory Functional Levels

Active Directory functional levels are of two types, as shown in the following table.

Domain and Forest Functional Levels

Type of Functional Level	Description
Domain functional level	Domain functional levels enable features that affect the entire domain and that domain only. It also controls which Windows Server operating systems can be run on domain controllers in the domain.
Forest functional level	Forest functional levels enable features across all domains within a forest. It also controls which Windows Server operating systems can be run on domain controllers in all domains in the forest.

The following table shows the relationship and dependencies between domain and forest functional levels.

Relationship Between Domain and Forest Functional Levels

Domain Functional Level	Forest Functional Level
Windows 2000 mixed	Windows 2000
Windows 2000 native	Windows 2000
Windows Server 2003	Windows Server 2003

A fourth domain functional level, Windows Server 2003 interim, is available for upgrades directly from Windows NT 4.0 to Windows Server 2003.

Default Windows Server 2003 Active Directory Features Available with All Functional Levels

Although many new features in Windows Server 2003 Active Directory have operational requirements that are available only at specific functional levels, most Windows Server 2003 Active Directory features are available by default at all functional levels. When the first Windows Server 2003-based domain controller is deployed in a domain or forest, a set of default Active Directory features becomes available. The following table summarizes the Active Directory features that are available by default on any domain controller running Windows Server 2003.

Default Windows Server 2003 Active Directory Features

Feature	Functionality
Multiple selection of user objects	Allows you to modify common attributes of multiple user objects at one time.
Drag and drop functionality	Allows you to move Active Directory objects from container to container by dragging one or more objects to a location in the domain hierarchy. You can also add objects to group membership lists by dragging one or more objects (including other group objects) to the target group.
Efficient search capabilities	Search functionality is object-oriented and provides an efficient search that minimizes network traffic associated with browsing objects.

Saved queries	Allows you to save commonly used search parameters for reuse in Active Directory Users and Computers.
Active Directory command-line tools	Allows you to run new directory service commands for administration scenarios.
InetOrgPerson class	The inetOrgPerson class has been added to the base schema as a security principal and can be used in the same manner as the user class.
Application directory partitions	Allows you to configure the replication scope for application-specific data among domain controllers. For example, you can control the replication scope of Domain Name System (DNS) zone data stored in Active Directory so that only specific domain controllers in the forest participate in DNS zone replication.
Ability to add additional domain controllers by using backup media	Reduces the time it takes to add an additional domain controller in an existing domain by using backup media.
Universal group membership caching	Prevents the need to locate a global catalog across a wide area network (WAN) when logging on by storing universal group membership information on an authenticating domain controller running Windows Server 2003.
Secure Lightweight Directory Access Protocol (LDAP) traffic	Active Directory administrative tools sign and encrypt all LDAP traffic by default. Signing LDAP traffic guarantees that the packaged data comes from a known source and that it has not been tampered with.
Partial synchronization of the global catalog	Provides improved replication of the global catalog when schema changes add attributes to the global catalog partial attribute set. Only the new attributes are replicated, not the entire global catalog.
Active Directory quotas	Quotas can be specified in Active Directory to control the number of objects a user, group, or computer can own in a given directory partition. Members of the Domain Admins and Enterprise Admins groups are exempt from quotas.

Domain Functional Level

Windows Server 2003 Active Directory domain functional levels represent the extension of the mixed and native domain modes that were available in Windows 2000:

- In Windows 2000 Active Directory, certain features are enabled only when all domain controllers in a domain are running Windows 2000 and the domain mode is set to native mode. Otherwise, the domain is running in mixed mode, where only features that are compatible with Windows NT 4.0-based domain controllers are operational. The domain administrator must change the mode from mixed to native and ensure that Windows NT 4.0-based domain controllers are no longer required in the domain.
- In Windows Server 2003 Active Directory, the domain functional levels that correspond to mixed mode and native mode are the Windows 2000 mixed and Windows 2000 native functional levels, respectively. Raising the domain functional level from Windows 2000 mixed to Windows 2000 native is still based on the discretion of the administrator and Active Directory does not verify that the domain has no Windows NT 4.0-based domain controllers in the domain.

In addition to these two domain functional levels, Windows Server 2003 provides a new domain functional level called Windows Server 2003. Before a domain can be raised to this functional level, all domain controllers in the domain must be running Windows Server 2003. Before allowing the administrator to raise a domain to this functional level, Active Directory verifies that all domain controllers in the domain are running Windows Server 2003.

For those upgrading from Windows NT 4.0 directly to Windows Server 2003, another domain functional level called Windows Server 2003 interim accommodates only domain controllers that are running Windows NT 4.0 and Windows Server 2003 and excludes Windows 2000-based domain controllers. For more information about this interim domain functional level, see "Functional Levels when Upgrading Windows NT 4.0 Domains" later in this section.

Just as in Windows 2000 where you could not revert from a native mode to a mixed mode domain, raising the domain functional level in Windows Server 2003 is not reversible. The only changes that occur in an environment when raising the functional level is the availability of advanced Active Directory features.

The default domain functional level for a new Windows Server 2003 installation or upgrade is Windows 2000 mixed in all cases except when upgrading a Windows 2000 domain that is in native mode. In this case, the default domain functional level is Windows 2000 native.

Features Enabled by the Domain Functional Level

The following table shows the features that are enabled at different domain functional levels and the operating systems that are supported on domain controllers at each level.

Windows Server 2003 Domain Functional Levels and Enabled Features

Domain Functional Level	Enabled Features	Supported Domain Controllers
Windows 2000 mixed	All default Active Directory features.	Windows Server 2003 Windows 2000 Windows NT 4.0
Windows 2000 native	All default Active Directory features and the following features: <ul style="list-style-type: none"> ● Universal groups enabled for both distribution and security groups. ● Group nesting ● Group conversion is enabled, allowing conversion between security and distribution groups. ● Security identifier (SID) history. 	Windows Server 2003 Windows 2000
Windows Server 2003 interim	All default Active Directory features.	Windows NT 4.0 Windows Server 2003
Windows Server 2003	All default Active Directory features, all features from the Windows 2000 native domain functional level, and the following features: <ul style="list-style-type: none"> ● The availability of the domain management tool, netdom.exe, to prepare for domain controller rename. ● Update of logon timestamp. The lastLogonTimestamp attribute will be updated with the last logon time of the user or computer. This attribute is replicated within the domain. ● The capability to set the userPassword attribute as the effective password on inetOrgPerson and user objects. ● The ability to redirect Users and Computers containers. In Windows 2000 Active Directory, two well-known containers are provided for housing computer and user/group accounts: namely, cn=Computers,<domain root> and cn=Users,<domain root>. This feature allows defining a new well-known location for these accounts. ● Allows for Authorization Manager to store its authorization policies in Active Directory. ● Includes constrained delegation, which allows applications to take advantage of the secure delegation of user credentials by means of Kerberos authentication protocol. Delegation can be configured to be allowed only to specific destination services. ● Supports selective authentication, by which it is possible to specify the users and groups from a trusted forest who are allowed to authenticate to resource servers in a trusting forest. 	Windows Server 2003

Forest Functional Level

Forest functional levels are new in Windows Server 2003. Features that become available at forest functional levels must be compatible with all domain controllers in the forest.

Features Enabled at Forest Functional Levels

The following table shows the features that are enabled and the supported operating systems of domain controllers for each forest functional level. At the Windows Server 2003 forest functional level, all Windows Server 2003 Active Directory features are available.

Windows Server 2003 Forest Functional Levels and Enabled Features

Forest Functional Level	Enabled Features	Supported Domain Controllers
Windows 2000	All default Active Directory features.	Windows

Windows Server 2003 Interim	All default Active Directory features, and: <ul style="list-style-type: none">Linked-value replication (change in group membership to store and replicate values for individual members instead of replicating the entire membership as a single unit). This change results in lower network bandwidth and processor usage during replication and eliminates the possibility of lost updates when different members are added or removed concurrently at different domain controllers.Improved KCC algorithms and scalability. The Intersite Topology Generator (ISTG) has been updated to use improved algorithms that scale to support forests with a greater number of sites than in Windows 2000. The improved ISTG election algorithm is a less intrusive mechanism for choosing the ISTG.	Server 2003 Windows 2000 Windows NT 4.0 Windows NT 4.0 Windows Server 2003
Windows Server 2003	All default Active Directory features, and the following features: <ul style="list-style-type: none">Linked-value replication (changes in group membership to store and replicate values for individual members instead of replicating the entire membership as a single unit). This change results in lower network bandwidth and processor usage during replication and eliminates the possibility of lost updates when different members are added or removed concurrently at different domain controllers.Improved KCC algorithms and scalability. The ISTG has been updated to use improved algorithms that will scale to support forests with a greater number of sites than in Windows 2000. The improved ISTG election algorithm is a less intrusive mechanism for choosing the ISTG.Improved ISTG algorithm (better scaling of the algorithm that the ISTG uses to connect all sites in the forest).Ability to create instances of the dynamic auxiliary class called dynamicObject in a domain directory partition.Ability to convert an inetOrgPerson object instance into a User object instance, and vice versa.Ability to create instances of the new group types basic and query based for role-based authorization support.Deactivation and redefinition of attributes and classes in the schema.Forest trust.Domain rename.	Windows Server 2003

As a side effect of raising the forest functional level to Windows Server 2003, the following new attributes are replicated to the partial attribute set of the global catalog:

- Ms-DS-Trust-Forest-Trust-Info
- Trust-Direction
- Trust-Attributes
- Trust-Type
- Trust-Partner
- Security Identifier
- Ms-DS-Entry-Time-To-Die
- MSMQ-Secured-Source
- MSMQ-Multicast-Address
- Print-Memory
- Print-Rate

- Print-Rate-Unit
- MS-DRM-Identity-Certificate

When the forest functional level is Windows Server 2003 or Windows Server 2003 interim, the global catalog is present on Windows Server 2003 domain controllers, so replication traffic due to the addition of these attributes to the partial attribute set is not significant. This is because of the new feature in Windows Server 2003 that allows partial synchronization of the global catalog.

Functional Level for New Windows Server 2003 Deployments

In a new deployment of Windows Server Active Directory that does not involve upgrading an existing domain, the first domain controller is created by installing Active Directory on a server that is running Windows Server 2003 and becomes the domain controller for the forest root domain. The forest functional level of the newly created forest is Windows 2000 and the domain functional level is Windows 2000 mixed. Immediately raising the domain level and then the forest level to Windows Server 2003 provides full Windows Server 2003 functionality with no further intervention. All domains subsequently created in the forest are created at the Windows Server 2003 functional level.

Functional Level when Upgrading Windows NT 4.0 Domains

Active Directory provides an intermediate functional level called Windows Server 2003 interim for user environments that currently have only Windows NT 4.0-based domain controllers and that have the following domain upgrade plans:

- Plan to upgrade to a Windows Server 2003 forest directly from Windows NT 4.0.
- Do not plan to install domain controllers running Windows 2000 at any time.

Moving to the Windows Server 2003 interim forest functional level is especially useful for large groups (greater than 5000 members) in an existing deployment for which upgrading to Windows 2000 would require breaking those groups into smaller groups. Windows 2000 replication limits the size of Windows 2000 groups; Windows Server 2003 replication supports large groups (greater than 5,000 members) because of the link-valued replication feature, which is available only if the forest functional level is Windows Server 2003 interim or higher.

◆ Important

- Windows Server 2003 interim functional level does not support domain controllers that are running Windows 2000. For this reason, if Windows 2000-based domain controllers are in the current deployment or there are plans to install Windows 2000-based domain controllers in the future, do not use Windows Server 2003 interim functional level.

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Physical Structure for Active Directory Functional Levels

Each functional level has requirements that are enforced by Active Directory. Windows Server 2003 Active Directory includes a new attribute that enables domain controllers to recognize the current functional level of any domain and of the forest. A numbering system identifies the different functional levels. The Windows Server 2003 operating system also uses these level numbers as built-in indicators that enable domain controllers to identify highest and lowest supported levels.

Internal Representation of Functional Levels

Internally, functional levels are represented as positive integers. The following table lists the domain and forest functional levels that are available in Windows Server 2003 and their corresponding integer values.

Windows Server 2003 Domain and Forest Functional Levels

Domain Functional Levels	Forest Functional Levels
0 — Windows 2000 mixed	0 — Windows 2000
0 — Windows 2000 native	0 — Windows 2000
1 — Windows Server 2003 interim	1 — Windows Server 2003 interim
2 — Windows Server 2003	2 — Windows Server 2003

Both Windows 2000 mixed and Windows 2000 native domain functional levels are internally represented by the integer 0.

Storage of Functional Levels

In a Windows Server 2003 forest, the value of the functional levels of domain controllers, domains, and forests

are stored in a new attribute, **msDSBehaviorVersion**. This attribute is present on three different objects in the directory, each of which is authoritative for identifying the functional level of one of these three respective scopes (domain controller, domain, or forest). When enforcing domain and forest functional levels, Active Directory uses the value of **msDSBehaviorVersion** on the appropriate object to detect the current functional level.

Note

- The functional level of a domain controller cannot be raised. Its functional level is fixed by the operating system.

The following table summarizes the storage of functional levels in the **msDSBehaviorVersion** attribute on the three defining objects and directory partition locations for the three respective scopes.

Storage of Functional Levels in msDSBehaviorVersion Attribute

Functional Level Scope	Object	Directory Partition Where Object Is Located
Domain controller	NTDS Settings object (class nTDSDSA)	Configuration
Domain	Domain object (class domainDNS)	Domain
Forest	Partitions container object (class crossRefContainer)	Configuration

Storage of Domain Controller Functional Levels

Beginning with Windows Server 2003, the operating system has two built-in, fixed values that identify the functional levels of Active Directory with which it is compatible, as follows.

- A fixed value that indicates the highest functional level that is supported by the current product release. Windows Server 2003 operating systems have a value of 2, indicating that Windows Server 2003 is the highest functional level supported. Because Windows 2000 and Windows NT 4.0 do not recognize functional levels, a domain controller running one of these operating systems has an implied highest functional level value of 0.
- A fixed value that indicates the lowest functional level that is supported by the current product release. Windows Server 2003 operating systems have a value of 0, indicating that they support both Windows 2000 and Windows NT 4.0. Windows 2000 and earlier operating systems have an implied lowest functional level value of 0.

Active Directory uses these values to prohibit introduction of domain controllers that are running incompatible operating systems into the domain or forest.

When Active Directory is installed on a Windows Server 2003-based server to create a domain controller, the highest fixed value that is present in the operating system is stored in the **msDSBehaviorVersion** attribute of the NTDS Settings object (class **nTDSDSA**) associated with the domain controller. This value indicates the functional level of the domain controller. The NTDS Settings object is stored in the configuration directory partition (*cn=NTDS*

Settings,cn=ServerName,cn=servers,cn=sites,cn=configuration,dc=ForestRootDomainName). Because every domain controller holds a copy of the configuration directory partition, any domain controller can discover the functional level of any other domain controller in the forest.

Absence of this attribute on the NTDS Settings object indicates that the domain controller is running Windows 2000, and is treated as having a value of 0. Windows NT 4.0-based domain controllers do not have an NTDS Settings object.

Storage of Domain Functional Levels

The functional level of a domain is identified by the value in the **msDSBehaviorVersion** attribute on the domain object (class **domainDNS**) in the domain directory partition (*dc=DomainName,dc=ForestRootDomainName*). On the basis of this value, certain features are enabled that have an impact in the scope of a single domain only. Absence of this attribute on a domain object is equivalent to domain functional level 0.

Storage of Forest Functional Levels

The functional level of a forest is identified by the value in the **msDSBehaviorVersion** attribute on the Partitions container object (class **crossRefContainer**) in the configuration directory partition (*cn=partitions,cn=configuration,dc=ForestRootDomainName*). On the basis of this value, certain features are enabled that affect the entire forest. Absence of this attribute on the Partitions container is interpreted as forest level 0.

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Processes and Interactions with Active Directory Functional Levels

Functional levels protect against incompatibility. Before raising a functional level, Active Directory verifies that all domain controllers are running the correct version of the operating system. After raising the functional level, Active Directory no longer allows the introduction of a domain controller that is running an incompatible version of Windows Server.

Forest and domain functional levels are restrictive for domain controllers only. Clients can interact with Active Directory regardless of the domain or forest functional level that is in effect. In a domain that has a functional level of Windows Server 2003, domain controllers can still authenticate computers that are running earlier versions of Windows.

Raising Domain Functional Levels

The domain functional level can be raised by using Active Directory Domains and Trusts or Active Directory Users and Computers, which are Active Directory administrative tools that are available on each domain controller. The ability to raise the domain functional level depends on the operating systems that are running on domain controllers in the environment:

- If an environment has domain controllers running Windows NT 4.0 as well as domain controllers running Windows 2000 in the domain, Windows Server 2003-based domain controllers can be introduced, but the domain functionality is essentially that of a Windows 2000 mixed-mode domain.
- After all Windows NT 4.0-based domain controllers in an environment are upgraded to either Windows 2000 or Windows Server 2003, the domain functional level can be raised to Windows 2000 native, which provides functionality that is essentially that of a Windows 2000 native-mode domain.
- After all domain controllers in the domain are upgraded to Windows Server 2003, the domain functional level can be raised to Windows Server 2003, which provides all Windows Server 2003 domain-level features.

It is possible to raise the domain functional level directly to Windows Server 2003 from Windows 2000 mixed after all domain controllers in the domain are upgraded to Windows Server 2003.

◆ Important

- Raising the domain functional level cannot be reversed. After the domain functional level is raised, domain controllers that are not supported at that level can no longer be introduced.

The following requirements apply to raising all domain functional levels:

- Raising the domain functional level requires Domain Admins credentials.
- The domain functional level can be raised on only the primary domain controller (PDC) emulator operations master. Active Directory administrative tools (Active Directory Domains and Trusts and Active Directory Users and Computers) automatically target the PDC emulator when the domain functional level is raised.

Raising Forest Functional Levels

When Windows Server 2003 is installed on the first domain controller in the forest, the forest functional level is set to Windows 2000. The forest retains this level until an administrator changes it. Raising the forest level to Windows Server 2003 has the following requirements:

- All domain controllers in the forest are running Windows Server 2003.
- All domains in the forest have either the Windows 2000 native or the Windows Server 2003 functional level.

Therefore, if any domains are operating at the Windows 2000 mixed domain functional level, even if all domain controllers are running Windows Server 2003, Active Directory does not allow the forest functional level to be raised to Windows Server 2003.

If all domain controllers in the forest are running Windows Server 2003, but some or all domains in the forest are still operating at the Windows 2000 native domain functional level, Active Directory automatically raises the functional level of those domains to Windows Server 2003 when the forest functional level is raised to Windows Server 2003.

Active Directory Domains and Trusts can be used to raise the forest functional level.

◆ Important

- Raising the forest functional level cannot be reversed. After the forest functional level is raised, domain controllers that run Windows 2000 or earlier can no longer be introduced into the forest.

The following requirements apply to raising all forest functional levels:

- Raising the forest functional level requires Enterprise Admins credentials.

- The forest functional level can be raised on only the Schema operations master. Active Directory Domains and Trusts automatically targets the Schema operations master when the forest functional level is raised.

Enforcing Functional Levels

To ensure consistent functionality across the domain controllers in a domain or forest, Active Directory checks for functional levels as follows:

- At domain controller creation.
- After a directory restore.
- At domain controller startup.
- When raising functional levels.

The Active Directory Installation Wizard, the application that installs Active Directory when a new domain controller is created, ensures that a domain controller is not created in a domain or forest that cannot support it. The wizard verifies whether the current domain or forest functional level falls within the highest and lowest fixed values for the operating system on the new domain controller. If the values are not compatible, the Active Directory installation fails. For example, if the domain has the functional level Windows Server 2003 (domain level 2), an attempt to install Active Directory on a Windows 2000-based server to create an additional domain controller fails because the highest and lowest fixed value supported by Windows 2000 is 0. Similarly, if the forest has a functional level of Windows Server 2003 (forest level 2), an attempt to install Active Directory to create a new domain on a Windows 2000-based server fails.

Active Directory likewise prevents restoring a domain controller into a domain or forest that has an incompatible functional level.

When a domain controller starts, an additional test is performed to verify whether the highest fixed value of the operating system matches the value of the **msDSBehaviorVersion** attribute on the NTDS Settings object of the domain controller.

Checks for Raising Domain and Forest Functional Levels

Active Directory determines whether the functional level can be raised, as follows:

- The ability to raise the domain functional level depends on the functional levels of all domain controllers in the domain. In general, the functional level of the domain can be no higher than the lowest functional level of any domain controller in the domain.
- The ability to raise the forest functional level depends on the functional level of all domain controllers in the forest. In general, the forest level can be no higher than the lowest functional level of any domain controller in the forest.

Note

- The ability to raise domain and forest functional levels is provided in the administrative tools Active Directory Users and Computers (raise domain functional level) and Active Directory Domains and Trusts (raise domain and forest functional levels).

Verifying Minimum Required Functional Level of Domain Controllers

When an administrator attempts to raise the functional level of the forest or domain, Active Directory checks the value of **msDSBehaviorVersion** on the NTDS Settings object of every domain controller within the scope (forest or domain) to determine if that value is equal to or greater than the desired functional level. If it is not, Active Directory prevents raising the functional level.

For example, if the request is received to raise the domain level to 2 (Windows Server 2003), Active Directory checks that the value of **msDSBehaviorVersion** on the NTDS Settings object on all domain controllers in the domain is 2 or higher before making the change. If all domain controllers are running Windows Server 2003, the value of **msDSBehaviorVersion** on the NTDS Settings object of each domain controller is 2, and thus Active Directory allows raising the functional level of the domain to Windows Server 2003.

If any domain controller is running Windows 2000, the fact that **msDSBehaviorVersion** attribute is missing on the NTDS Settings object indicates Windows 2000 and an implied value of 0, and Active Directory will prevent raising the domain functional level to Windows Server 2003. However, Windows NT 4.0-based domain controllers do not have an NTDS Settings object, so Active Directory cannot check these machines directly for functional level. For this reason, Active Directory performs an additional check to rule out the existence of Windows NT 4.0-based domain controllers.

Ruling Out Windows NT 4.0-Based Domain Controllers When Raising the Forest Level to Windows Server 2003

When a member of the Enterprise Admins group attempts to raise the forest functional level to Windows Server 2003 (level 2), Active Directory checks for the absence of Windows NT 4.0-based domain controllers by checking the **ntMixedDomain** attribute of the domain object. The **ntMixedDomain** attribute identifies a Windows 2000 domain as being in mixed mode or native mode.

The **ntMixedDomain** attribute on the domain object indicates the status of mixed or native domain mode as follows:

- **ntMixedDomain** value of 1 indicates mixed mode (Windows NT 4.0-based domain controllers can be present in the domain).
- **ntMixedDomain** value of 0 indicates native mode (no Windows NT 4.0-based domain controllers can be present in the domain).

To rule out the existence of Windows NT 4.0-based domain controllers when raising the forest functional level to Windows Server 2003 (level 2), Active Directory verifies that the **ntMixedDomain** attribute has a value of 0 for every domain in the forest.

Ruling Out Windows NT 4.0 Domain Controllers When Raising the Domain Level to Windows Server 2003

Unlike the behavior when raising the forest functional level, Active Directory does not check for the absence of Windows NT 4.0-based domain controllers at the time an administrator raises the domain functional level. Just as in Windows 2000, a domain administrator is responsible for ensuring that no Windows NT 4.0-based domain controllers are running in the domain before raising the domain functional level from Windows 2000 mixed to Windows 2000 native or Windows Server 2003.

Note

- If an administrator changes the mode of a Windows 2000 domain from mixed to native mode or raises the domain functional level from Windows 2000 mixed to Windows 2000 native (or Windows Server 2003) when Windows NT 4.0-based domain controllers are present in the domain, the remaining Windows NT 4.0-based domain controllers no longer participate in the Active Directory forest. Therefore the domain administrator must be absolutely sure that no Windows NT4.0-based domain controllers are operating in the domain before raising the domain functional level to Windows 2000 native or Windows Server 2003.

When the domain functional level is raised to Windows Server 2003, Active Directory not only raises the domain functional level to 2, but also changes the **ntMixedDomain** value from 1 to 0. When the domain functional level is raised to Windows 2000 native, Active Directory only changes the **ntMixedDomain** value from 1 to 0.

Checks for Raising the Functional Level to Windows Server 2003 Interim (Level 1)

When attempting to raise the forest functional level to Windows Server 2003 interim, Active Directory verifies that all domain controllers in the forest are at level 1 or higher (by checking the **msDSBehaviorVersion** attribute on the NTDS Settings object for each domain controller in the forest, to ensure that it is at level 1 or higher). However, it does not verify that all domains have a Windows 2000 native functional level (the **ntMixedDomain** attribute value of the domain object is 0).

The absence of this check allows Windows NT 4.0-based domain controllers to coexist with Windows Server 2003-based domain controllers, but precludes future introduction of Windows 2000-based domain controllers into the domain or forest. This is because the highest and lowest functional level supported by Windows 2000 is 0 (which is less than 1), and when you attempt to install Active Directory on a Windows 2000 server, the Active Directory Installation Wizard will determine that the forest is at level 1 and will prevent the installation.

When the forest functional level is raised to Windows Server 2003 interim, Active Directory raises the forest functional level to 1. Consequently, every domain also raises its functional level (the domain functional level) to 1 (and therefore every domain is also at Windows Server 2003 interim level), but leaves the **ntMixedDomain** value at 1, thus allowing Windows NT 4.0-based domain controllers to coexist with Windows Server 2003-based domain controllers.

There is no administrative UI for raising the forest and domain functional levels to Windows Server 2003 interim. An LDAP application such as ADSI Edit or Ldp in Windows Support Tools can be used, or a script can be used. In either case, the value of the **msDSBehaviorVersion** attribute should be modified to 1.

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Related Information

The following resources contain additional information that is relevant to this section.

- [How DNS Support for Active Directory Works](#)
- "Support Tools Help" in the [Tools and Settings Collection](#) for information about ADSI Edit
- "Support Tools Help" in the [Tools and Settings Collection](#) for information about Ldp