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## Subject: Flexible single master operation

Flexible single master operation

Description

Flexible Single Master Operations, or just single master operation or operations master, is a feature of Microsoft's Active Directory. As of 2005, the term FSMO has been deprecated in favour of operations masters

**Flexible single master operation** (FSMO) is a Microsoft Active Directory feature that is a specialized domain controller task used when standard data transfer and update methods are inadequate.

What are the 5 FSMO roles?

**Currently in Windows there are five FSMO roles:**

* Schema master.
* Domain naming master.
* RID master.
* PDC emulator.
* Infrastructure master.

## Multi-master model

A multi-master enabled database, such as the Active Directory, provides the flexibility of allowing changes to occur at any DC in the enterprise. But it also introduces the possibility of conflicts that can potentially lead to problems once the data is replicated to the rest of the enterprise. One way Windows deals with conflicting updates is by having a conflict resolution algorithm handle discrepancies in values. It's done by resolving to the DC to which changes were written last, which is the **last writer wins**. The changes in all other DCs are discarded. Although this method may be acceptable in some cases, there are times when conflicts are too difficult to resolve using the **last writer wins** approach. In such cases, it's best to prevent the conflict from occurring rather than to try to resolve it after the fact.

For certain types of changes, Windows incorporates methods to prevent conflicting Active Directory updates from occurring.

**Single-master model**

To prevent conflicting updates in Windows, the Active Directory performs updates to certain objects in a single-master fashion. In a single-master model, only one DC in the entire directory is allowed to process updates. It's similar to the role given to a primary domain controller (PDC) in earlier versions of Windows, such as Microsoft Windows NT 3.51 and 4.0. In earlier versions of Windows, the PDC is responsible for processing all updates in a given domain.

Active Directory extends the single-master model found in earlier versions of Windows to include multiple roles, and the ability to transfer roles to any DC in the enterprise. Because an Active Directory role isn't bound to a single DC, it's referred to as an FSMO role. Currently in Windows there are five FSMO roles:

* Schema master
* Domain naming master
* RID master
* PDC emulator
* Infrastructure master

Typically, an FSMO role ownership is executed only when the domain controller has replicated the naming context (NC) where the ownership is stored since the Directory Service started. Make sure that an FSMO role seizure reaches the previous owner before the role is used.

### Schema master FSMO role

The schema master FSMO role holder is the DC responsible for performing updates to the directory schema, that is, the schema naming context or LDAP://cn=schema,cn=configuration,dc=<domain>. This DC is the only one that can process updates to the directory schema. Once the Schema update is complete, it's replicated from the schema master to all other DCs in the directory. There's only one schema master per forest.

#### Initial replication and connectivity requirements

* This FSMO role holder is only active when the role owner has inbound replicated the schema NC successfully since the Directory Service started.
* DCs and members of the forest only contact the FSMO role when they update the schema.

### Domain naming master FSMO role

The domain naming master FSMO role holder is the DC responsible for making changes to the forest-wide domain name space of the directory, that is, the Partitions\Configuration naming context or LDAP://CN=Partitions, CN=Configuration, DC=<domain>. This DC is the only one that can add or remove a domain from the directory. It can also add or remove cross references to domains in external directories.

#### Initial replication and connectivity requirements

* This FSMO role holder is only active when the role owner has inbound replicated the configuration NC successfully since the Directory Service started.
* Domain members of the forest only contact the FSMO role holder when they update the cross-references. DCs contact the FSMO role holder when:
  + Domains are added or removed in the forest.
  + New instances of application directory partitions on DCs are added. For example, a DNS server has been enlisted for the default DNS application directory partitions.

**RID master FSMO role**

The RID master FSMO role holder is the single DC responsible for processing RID Pool requests from all DCs within a given domain. It's also responsible for removing an object from its domain and putting it in another domain during an object move.

When a DC creates a security principal object, such as a user or group, it attaches a unique Security ID (SID) to the object. This SID consists of:

* A domain SID that's the same for all SIDs created in a domain.
* A relative ID (RID) that's unique for each security principal SID created in a domain.

Each Windows DC in a domain is allocated a pool of RIDs that it's allowed to assign to the security principals it creates. When a DC's allocated RID pool falls below a threshold, that DC issues a request for additional RIDs to the domain's RID master. The domain RID master responds to the request by retrieving RIDs from the domain's unallocated RID pool, and assigns them to the pool of the requesting DC. There's one RID master per domain in a directory.

## Summary

Active Directory is the central repository in which all objects in an enterprise and their respective attributes are stored. It's a hierarchical, multi-master enabled database that can store millions of objects. Changes to the database can be processed at any given domain controller (DC) in the enterprise, regardless of whether the DC is connected or disconnected from the network.