IW3 - Active Directory: Introduction, AD structure, FSMO

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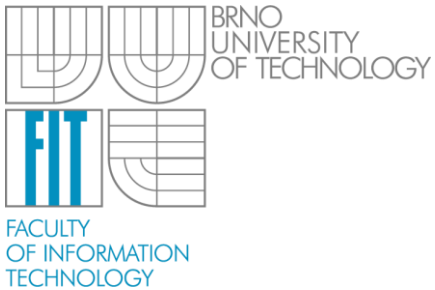


What is Active Directory?

- Active Directory (AD) is a directory service that Microsoft developed for Windows domain networks and is included in most Windows Server operating systems as a set of processes and services.
- An AD domain controller authenticates and authorizes all users and computers in a Windows domain type network—assigning and enforcing security policies for all computers and installing or updating software.
- Active Directory makes use of Lightweight Directory Access Protocol (LDAP) versions 2 and 3, Microsoft's version of Kerberos, and DNS.

History

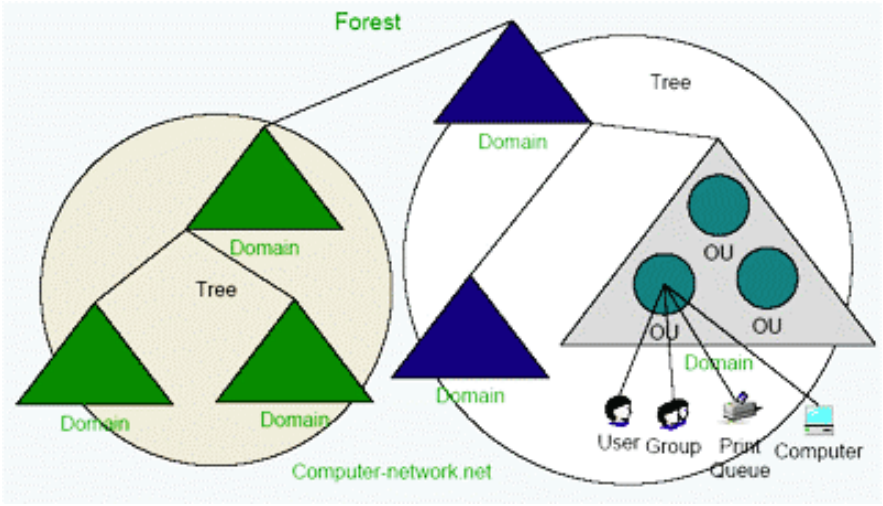
- Roots like everything other in computer networks in RFCs - RFC 1823 (on the LDAP API, August 1995),[4] RFC 2307, RFC 3062, and RFC 4533
- Microsoft previewed Active Directory in 1999, released it first with Windows 2000 Server edition
- Revised and extended functionality and improve administration in Windows Server 2003
- Additional improvements came with Windows Server 2003 R2, Windows Server 2008, and Windows Server 2008 R2
- With the release of the last Windows Server 2012 and Windows Server 2012 R2, Microsoft renamed the *domain controller* role as *Active Directory Domain Services* (AD DS)

- AD DS improvements in Windows Server 2012 include:
  - Virtualization that just works
    - Virtualization-safe technologies and the rapid deployment of virtual domain controllers through cloning.
  - Simplified deployment and upgrade preparation
    - The upgrade and preparation processes (dcpromo and adprep) have been replaced with a new streamlined domain controller promotion wizard that is integrated with Server Manager and built on Windows PowerShell.
  - Simplified management
    - Active Directory Administrative Center (ADAC) now allows you to perform graphical tasks that automatically generate the equivalent Windows PowerShell commands.
  - AD DS Platform Changes
    - Updates to the AD DS platform include improved allocation and scale of RIDs

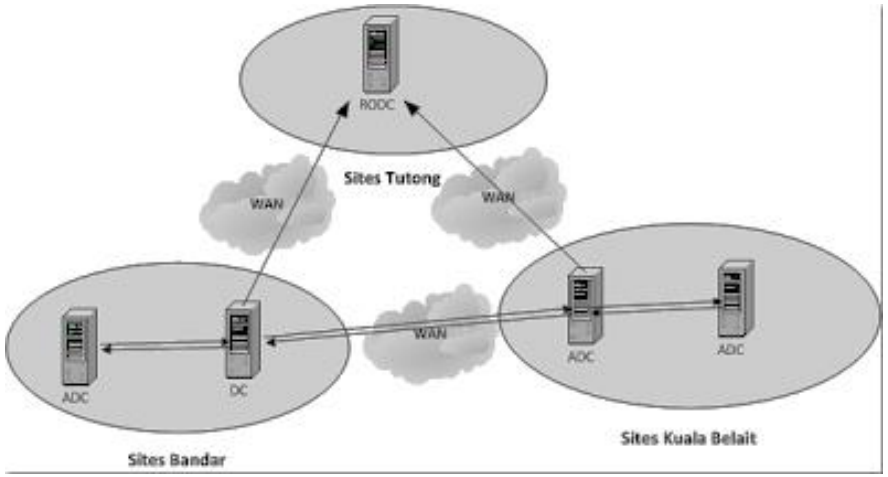
Logical structure vs Physical structure

- Organizational units
- Domains
- Trees
- Forests

- Active Directory sites (physical subnets)
- Domain controllers



- http://computer-network.wifi-lifestyle.com/active-directory-2003



- http://prakash-nimmala.blogspot.cz/2012/04/active-directory-concepts-part2.html

Physical structure

- The physical structure of Active Directory helps to manage the communication between servers with respect to the directory.
- The two physical elements of Active Directory are **domain controllers** and **sites**.

Domain Controllers

- Domain controllers are Windows XXXX Server-based systems that store the Active Directory database.
- Every Windows XXXX domain controller has a writable copy of the directory (except RODC)
- Domain controllers in the same domain contain replicas of the directory that must be synchronized periodically

Site

- Groups of IP subnets that are connected at high speed.
  - Generally considered to be subnets that are connected at LAN speeds (say 10 Mb) or higher.
- The purpose is to control network traffic relating to replication, as well as to help ensure that users connect to local resources.
- The replication inside the site (intra-site) is almost instantaneous (15 seconds) on the contrary, inter-site replication is scheduled by default in 180 minutes intervals.
  - Inter-site replication can also be scheduled to specific windows to ensure that the replication traffic does not interfere with normal data transfers.

Logical structure

- Active Directory instance consists of a **database** and corresponding executable code responsible for servicing requests and maintaining the database.
  - The executable part, known as Directory System Agent, is a collection of Windows services and processes that run on Windows 2000 and later.
- **Objects** in Active Directory databases can be accessed via LDAP protocol, ADSI (a component object model interface), messaging API and Security Accounts Manager services.

Objects

- An Active Directory structure is an arrangement of information about objects. The objects fall into two broad categories: **resources** (e.g., printers) and **security principals** (user or computer accounts and groups).
- Security principals are assigned unique security identifiers (SIDs).
- Each object represents a single entity—whether a user, a computer, a printer, or a group—and its attributes.
- An object is uniquely identified by its name and has a set of attributes—the characteristics and information that the object represents— defined by a schema, which also determines the kinds of objects that can be stored in Active Directory.
- The schema object lets administrators extend or modify the schema when necessary.

Domain

- **A logical group** of users and computers that share the characteristics of centralized security and administration.
- **A boundary for security** – this means that an administrator of a domain is an administrator for only that domain, and no others, by default
- **A boundary for replication** – all domain controllers that are part of the same domain must replicate with one another
- Domains in the same forest automatically have *trust relationships configured*.

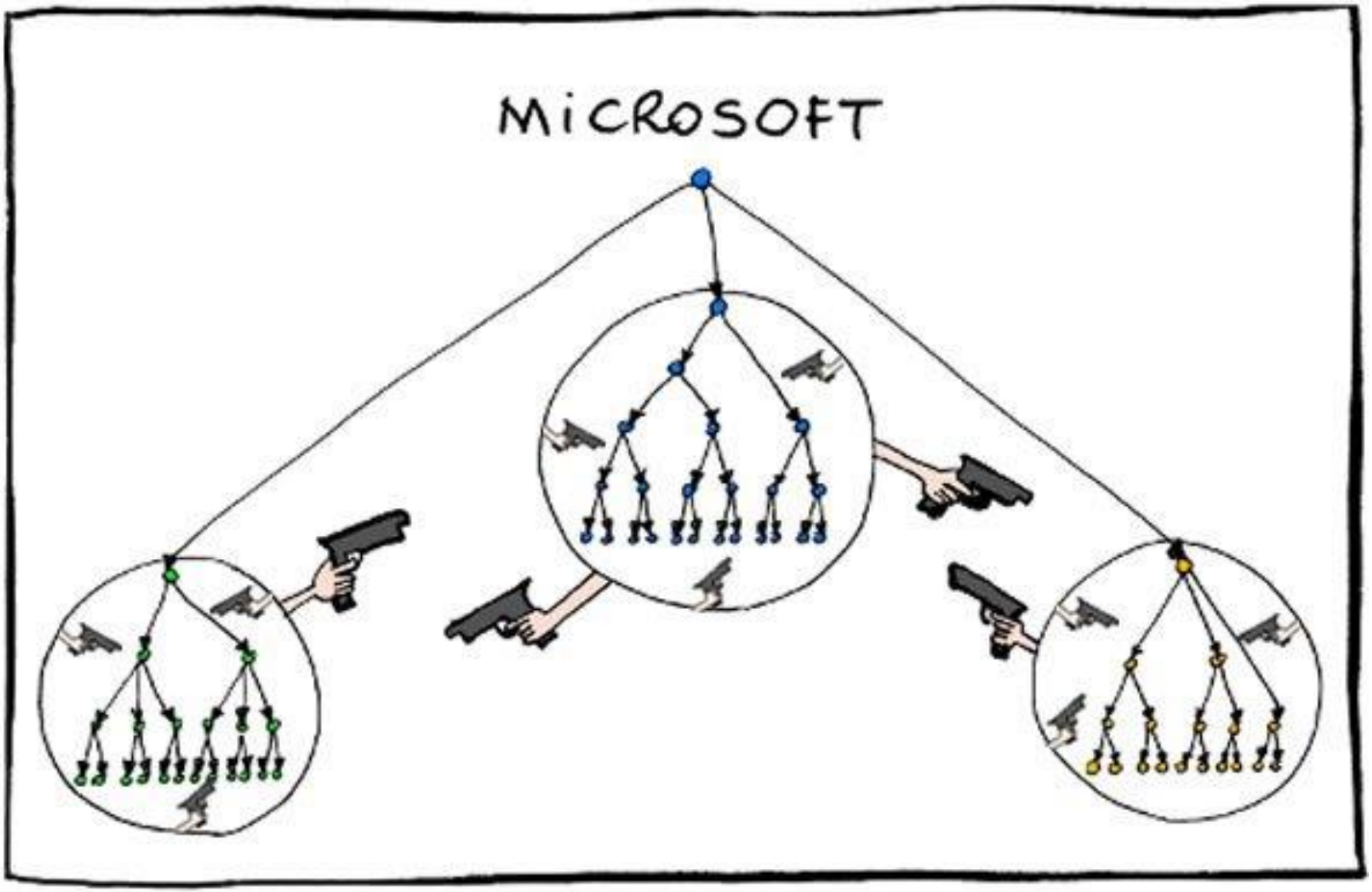
Tree

- **A collection of Active Directory domains** that share a contiguous namespace
- In this configuration, domains fall into a **parent-child relationship**, which *the child domain taking on the name of the parent*.

Forest (a set of trees)

- The largest unit in Active Directory and is a collection of trees that share **a common Schema** - the definition of objects that can be created.
- All trees are connected by transitive two-way trust relationships, thus allowing users in any tree access to resources in another for which they have been given appropriate permissions and rights.
- **By default** the first domain created in a forest is referred to as *the root domain*.

AD Forest



•http://static.businessinsider.com/image/51dfec8469bedd5e19000017-1200/image.jpg

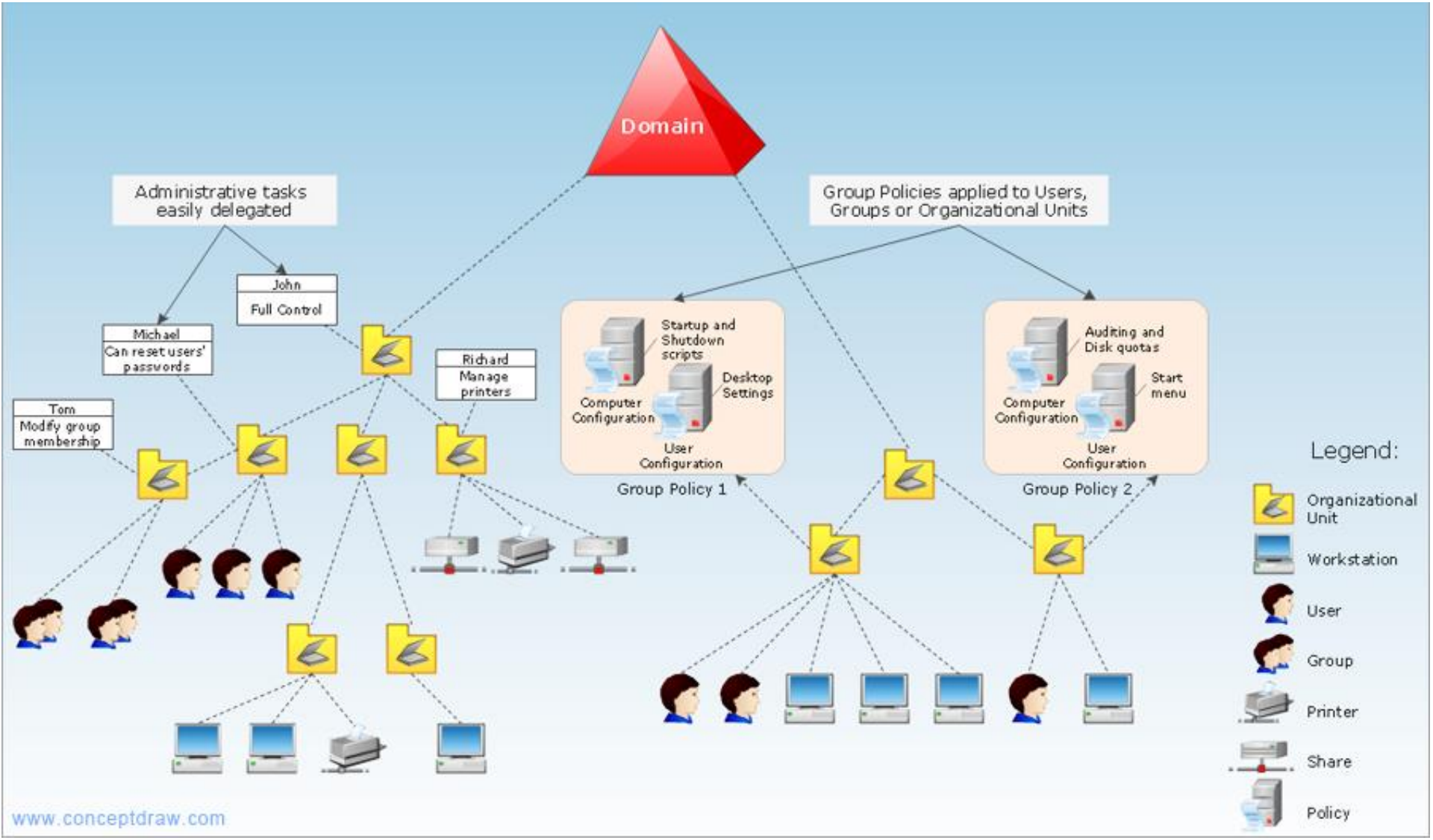
Organizational Unit (OU)

- A container object that *helps to organize objects* for the purpose of administration or group policy application.
- An OU exists within a domain and *can only contain objects from that domain*.
- **OU can be nested**, which allows for more flexibility in terms of administration.
- Different methods for designing OU structures exists
  - Geographical
  - For a delegation of administrative authority
  - …

Global Catalog

- Listings of every object that exists within an Active Directory **forest**
- By default, a domain controller only contains information about objects in that domain
- A **Global Catalog server** is a domain controller that contains information about every object (though not every attribute for each) stored in *the entire forest*.
- Facilitates and speeds up the search for information in Active Directory.
- By default only the first domain controller created in a forest has a copy of the global catalog.

Active Directory Domain Service Diagram



- **http://www.conceptdraw.com/How-To-Guide/active-directory-diagram**

- Instalace AD + připojení klienta do domény
  - nastartujte w2012-base a pomoci server manageru nainstalujte AD DS services
  - připojte do domény w8-base
  - vytvořte organizační jednotku, uživatele a skupinu
  - v konzoli AD Users and Computers zobrazte „Advenced Features“, prozkoumejte detailní nastavení uživatele
  - ptejte se lektora na to co, jste zapomněli ☺

Active Directory – lab2

- Prozkoumání vylepšení v Active Directory Administrative Center
  - Vytvořte objekt uživatele, skupiny a novou organizační jednotku
    - Uživatel Homer (Administrators), Bart
    - Skupina Simpsons
    - OU Brno
  - Povolte Active Directory Recycle Bin
  - Vyzkoušejte smazání a odstranění uživatele a OU

Active Directory – lab3

- Management AD objektů v PowerShell
  - Prohlédněte si exitující uživatele a skupiny
    - Get-Command *-AD*
    - Get-ADUser, Get-ADGroup, Get-ADOrganizationalUnit
  - Vytvořte objekt uživatele, skupiny a novou organizační jednotku
    - Uživatel Superman (Domain Administrators), Spiderman
    - Skupina Superheroes
    - OU Hollywood
    - New-ADUser, New-ADGroup, New-ADOrganizationalUnit
- Postup obdobný jako **ad_introduction_lab.pdf** *Exercise 4,* popř. *IW2-exercices-03.pdf*

- Vzdálená instalace záložního řadiče
- nastartujte z w2012-base2
  - naaplikujte snapshot na r2 base, tak aby se „zresetoval" do původního stavu (lektor poradí jak)
  - připojte w2012-base2 do domény vytvoření v Lab1
  - nakonfigurujte base server na použití dns serveru na ad
- vzdáleně přes w2012-base
  - nainstalujte další řadič domény na base server
  - zkontrolujte zda se w2012-base2 přidal do domény jako DC

Postup obdobný jako **ad_introduction_lab.pdf**
Exercise 1

Active Directory – lab5

- Vzdálené nasazení Read-Only Domain Controller
- Zapnětě virtuální stroj w2012 XXX
- Z w2012-base
  - Použijte PowerShell k instalaci AD DS na daný stroj **Install-WindowsFeature**
  - Povyšte stroj do role RODC obdobně jako …
    - Delegace lokálního administrátora na uživatele Homer

Invoke-Command –ComputerName Server2 –ScriptBlock {Import-Module ADDSDeployment;Install-ADDSDomainController –NoGlobalCatalog:$False –CreateDNSDelegation:$False –Credential (Get-Credential) –CriticalReplicationOnly:$False –DatabasePath "C:\Windows\NTDS" –DomainName "Contoso.com" –InstallDNS:$True –LogPath "C:\Windows\NTDS" –NoRebootOnCompletion:$False –SiteName "Default-First-Site-Name" –SysVolPath "C:\Windows\SysVol" }

    - otestujte delegaci lokálního administrátora
    - zkontrolujte přidání nového RODC do AD
    - otestujte možnost nastavení cachování hesel
    - na base serveru (pdc) „odstraňtě" přes users and computers konzoli účet serveru ad (rodc) a sledujte chování (možnost resetu hesla uživatelům co byli cacheovaní)

Flexible Single Master Operation Roles (FSMO)

- Active Directory has five special roles which are vital for the smooth running of AD as a multimaster system.
- Some functions of AD require there is an authoritative master to which all Domain Controllers can refer to.
- If you de-commission a DC and DCPROMO fails to run correctly or have a catastrophic failure of a DC you will need to know about these roles to recover or transfer them to another DC.

Flexible Single Master Operation Roles (FSMO)

Forest Wide Roles:

- Schema Master
- Domain Naming

Domain Wide Roles:

- Relative ID (RID) Master
- PDC Emulator
- Infrastructure Master

Schema Master

- Used to introduce manual and programmatic schema updates
- includes those updates that are added by Windows ADPREP /FORESTPREP
  - by Microsoft Exchange
  - by other applications that use Active Directory Domain Services (AD DS)
- *Must be online when schema updates are performed.*

AD object schema

drink Attribute

The drink (Favorite Drink) attribute type specifies the favorite drink of an object (or person).

CN	drink
Ldap-Display-Name	drink
Size	-
Update Privilege	-
Update Frequency	-
Attribute-Id	0.9.2342.19200300.100.1
System-Id-Guid	1a1aa5b5-262e-4df6-a
Syntax	String(Unicode)

•http://aheil.files.wordpress.com/2005/06/drink.png

Domain Naming Master

- Used to add and to remove domains and application partitions to and from the forest.
- *Must be online when domains and application partitions in a forest are added or removed.*

Primary Domain Controller (PDC emulator)

- *Receives password updates* when passwords are changed for the computer and for user accounts that are on replica domain controllers.
- Consulted by replica domain controllers that service authentication requests that have *mismatched passwords*.
- Default target domain controller for Group Policy updates.
- Target domain controller for legacy applications that perform writable operations and for some admin tools.
- Must be online and accessible 24 hours a day, seven days a week.

Relative ID (RID) Master

- Allocates active and standby RID pools to replica domain controllers in the same domain.
- *Must be online for newly promoted domain controllers to obtain a local RID pool that is required to advertise or when existing domain controllers have to update their current or standby RID pool allocation.*

Infrastructure Master

- Scope: Domain, **Application partition**
- Updates cross-domain references and phantoms from the global catalog.
- A *separate infrastructure master* is created for each application partition including the default forest-wide and domain-wide application partitions created by Windows Server 2003 and later domain controllers.

FSMO availability and placement

- The *Active Directory Installation Wizard* performs the initial placement of roles on domain controllers. This placement is frequently correct for directories that have just a few domain controllers.
- It's easier to keep track of FSMO roles if you host them on *fewer computers*.
- If a role has to be moved to a different domain controller, and the current role holder is online and available, you should *transfer (not seize)* the role to the new domain controller.
- *Place the schema master on the PDC of the forest root domain.*
- *Place the domain naming master on the forest root PDC.*

Transfer vs Seize

- **Recommendation – always transfer if possible**
- **Transfer** – both machines has to be online at the same time
- **Seize** – if targeted server has malfunctioned or disappeared, *general rule* - after seizing a role never return the DC back (except PDC, infrastructure)
- Tools
  - GUI administrative tools
  - **ntdsutil /roles**
  - **Netdom query fsmo**

- Vyzkoušejte přesun jednotlivých FSMO mezi řadiči domény pomocí
  - GUI administrativních nástrojů
  - Příkazové řádky **ntdsutil**
  - PowerShell **Move-ADDirectoryServerOperationMasterRole**

Recap

- What is the Active Directory physical and logical structure?

- What are Flexible Single Master Operation Roles (FSMO)?
- What they are used for?
- What is the preferred and safest way transfer/seize?

Sources

- http://en.wikipedia.org/wiki/Active_Directory
- http://technet.microsoft.com/en-us/library/cc181267.aspx
- http://support.microsoft.com/kb/223346/en-us
- http://www.ucs.cam.ac.uk/support/windows-support/winsuptech/activedir/fsmoroles

Thank you for attention!
Any questions?!