Active Directory Domain Implementation Project

Executive Summary

This project demonstrates the successful implementation of a Windows Server 2022 Active Directory domain environment with client integration and Group Policy management. The implementation showcases enterprise-level skills in domain administration, security policy enforcement, and infrastructure management essential for modern IT environments.

Key Achievements

- Successfully deployed Windows Server 2022 Domain Controller
- Implemented secure domain architecture with proper DNS configuration
- Configured and tested Group Policy Objects (GPOs) for security compliance
- Demonstrated client-server integration with Windows 10/11 Enterprise
- Established best practices for domain management and troubleshooting

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Project Scope and Objectives

Primary Objectives

1. **Infrastructure Deployment**: Set up enterprise-grade Active Directory domain services
2. **Security Implementation**: Configure Group Policy Objects for organizational security compliance
3. **Client Integration**: Successfully join Windows Enterprise clients to the domain
4. **Policy Management**: Implement and test various GPO configurations
5. **Documentation**: Create comprehensive technical documentation for knowledge transfer

Target Environment

- **Server OS**: Windows Server 2022
- **Client OS**: Windows 10/11 Enterprise
- **Domain Architecture**: Single domain forest
- **Virtualization**: VMware Workstation (lab environment)

Technical Architecture

Infrastructure Components

Domain Controller Specifications

- **Operating System**: Windows Server 2022
- **Roles Installed**:
  - Active Directory Domain Services (AD DS)
  - DNS Server
  - Group Policy Management
- **Network Configuration**: Static IP addressing
- **Security**: Integrated Windows Authentication

Client Configuration

- **Operating System**: Windows 10/11 Enterprise
- **Domain Membership**: Joined to corporate domain
- **Network Configuration**: DHCP with custom DNS settings
- **Management**: Centralized via Group Policy

Network Architecture

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Domain Controller (Static IP)
├── DNS Server (Primary)
├── Active Directory Services
├── Group Policy Management
└── Client Authentication Services

Client Machines (DHCP)
├── Domain-joined Windows Enterprise
├── DNS pointing to Domain Controller
└── Group Policy application
```

Implementation Procedures

Phase 1: Domain Controller Setup

1.1 Windows Server 2022 Configuration

- Installed Windows Server 2022 with Desktop Experience
- Configured static IP addressing for network stability
- Set DNS server to loopback address (127.0.0.1) for self-resolution
- Added Google DNS (8.8.8.8) as secondary for external resolution

1.2 Active Directory Installation

- Promoted server to Domain Controller
- Created new forest and domain structure
- Configured domain functional level for Windows Server 2022
- Established secure administrator credentials

1.3 DNS Configuration

- Configured integrated DNS zones
- Set up forward and reverse lookup zones
- Validated DNS resolution for domain services
- Implemented DNS forwarders for external name resolution

Phase 2: Client Integration

2.1 Windows Enterprise Client Setup

- Deployed Windows 10/11 Enterprise in virtual environment
- Configured network settings with Domain Controller as primary DNS
- Validated connectivity to domain services via ping and nslookup tests

2.2 Domain Join Process

- Successfully joined client machines to domain
- Moved computer objects from default Computers container to appropriate Organizational Units
- Validated domain authentication and user logon capabilities
- Configured appropriate computer descriptions and organizational placement

Phase 3: Group Policy Implementation

3.1 GPO Creation and Configuration

Implemented multiple Group Policy Objects including:

- **Restrict Control Panel Access**: User configuration policy preventing access to Control Panel
- **Password Policy**: Computer configuration enforcing strong password requirements
- **Drive Mapping**: User configuration for network drive assignments
- **USB Device Restrictions**: Computer configuration preventing unauthorized USB usage
- **Desktop Wallpaper**: User configuration for corporate branding

3.2 Organizational Unit Structure

- Created logical OU structure (USA → Users, Computers)
- Applied GPOs to appropriate OUs based on policy scope
- Implemented proper delegation and inheritance

3.3 Policy Testing and Validation

- Forced Group Policy updates using `gpupdate /force`
- Validated policy application through user experience testing
- Documented policy effects and compliance verification

Testing and Validation

Connectivity Testing

- **Ping Tests**: Verified network connectivity between Domain Controller and clients
- **DNS Resolution**: Confirmed proper name resolution using nslookup commands
- **Authentication**: Validated domain user logon capabilities

Group Policy Validation

- **Control Panel Restriction**: Confirmed users cannot access Control Panel after policy application
- **Policy Refresh**: Verified policies apply within expected timeframes (90 minutes default)
- **Force Update**: Demonstrated immediate policy application using gpupdate

Security Compliance

- **Domain Authentication**: All client access properly authenticated through domain
- **Centralized Management**: User accounts and policies managed centrally
- **Audit Trail**: Domain controller logs all authentication and policy events

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Troubleshooting and Resolution

Common Issues Encountered

DNS Resolution Problems

- **Issue**: Clients unable to locate domain controller
- **Resolution**: Configured client DNS settings to point to Domain Controller IP
- **Prevention**: Documented proper DNS configuration procedures

Group Policy Delays

- **Issue**: Policies not applying immediately after configuration
- **Resolution**: Implemented `gpupdate /force` for immediate policy refresh
- **Best Practice**: Educated on default 90-minute refresh cycle

Computer Object Placement

- **Issue**: Newly joined computers placed in default Computers container
- **Resolution**: Manually moved computer objects to appropriate OUs
- **Process**: Established standard procedure for new computer placement

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Security Considerations

Access Control

- Implemented least privilege principles for user accounts
- Configured appropriate administrative delegation
- Established secure password policies through Group Policy

Network Security

- DNS services restricted to internal domain resolution
- Static IP configuration prevents unauthorized DHCP conflicts
- Centralized authentication reduces credential exposure

Compliance

- Group Policy enforcement ensures consistent security baseline
- Centralized logging provides audit trail for compliance reporting
- Regular policy updates maintain security posture

Skills Demonstrated

Technical Competencies

- **Windows Server Administration**: Full deployment and configuration of Windows Server 2022
- **Active Directory Management**: Domain controller setup, OU design, and user management
- **DNS Administration**: Integrated DNS configuration and troubleshooting
- **Group Policy**: GPO creation, linking, and troubleshooting
- **Network Configuration**: Static IP setup, DHCP integration, and connectivity testing
- **Virtualization**: VMware Workstation environment management
- **Security Implementation**: Policy enforcement and compliance management

Professional Skills

- **Documentation**: Comprehensive technical documentation creation
- **Problem Solving**: Systematic troubleshooting and resolution approaches
- **Project Management**: Structured implementation methodology
- **Quality Assurance**: Thorough testing and validation procedures

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Business Value

Operational Benefits

- **Centralized Management**: Single point of control for user accounts and policies
- **Security Compliance**: Automated policy enforcement reduces security risks
- **Scalability**: Foundation supports enterprise growth and expansion
- **Cost Efficiency**: Centralized services reduce administrative overhead

Strategic Advantages

- **Standardization**: Consistent user experience across all domain clients
- **Audit Capabilities**: Comprehensive logging for compliance and troubleshooting
- **Integration Platform**: Foundation for additional enterprise services
- **Disaster Recovery**: Centralized backup and recovery capabilities

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Lessons Learned

Technical Insights

- Proper DNS configuration is critical for domain functionality
- Group Policy testing requires understanding of refresh cycles
- Computer object placement affects policy application
- Static IP addressing essential for server stability

Best Practices Established

- Always validate DNS resolution before domain join operations
- Force Group Policy updates for immediate testing requirements
- Maintain proper OU structure for policy inheritance
- Document all configuration changes for future reference

Future Enhancements

Potential Expansions

- **File and Print Services**: Network file sharing and printer management
- **Certificate Services**: PKI implementation for enhanced security
- **Remote Access**: VPN and DirectAccess configuration
- **Backup and Recovery**: Comprehensive disaster recovery planning
- **Monitoring**: System Center or third-party monitoring implementation

Scalability Considerations

- **Multi-site Configuration**: Branch office domain controller deployment
- **Forest Trusts**: Inter-domain authentication and resource sharing
- **Advanced GPO**: Software deployment and advanced security policies
- **Automation**: PowerShell scripting for administrative tasks

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Conclusion

This Active Directory implementation project successfully demonstrates enterprise-level Windows infrastructure skills essential for modern IT environments. The project showcases proficiency in domain controller deployment, client integration, Group Policy management, and comprehensive documentation practices.

The implementation provides a solid foundation for enterprise Windows environments while demonstrating the technical and professional skills required for system administrator and infrastructure roles. The comprehensive testing and validation procedures ensure reliable operation and provide confidence in the deployed solution.

This project serves as concrete evidence of hands-on experience with core Windows Server technologies and enterprise security practices, making it an excellent portfolio piece for IT career advancement.

Appendix

Configuration References

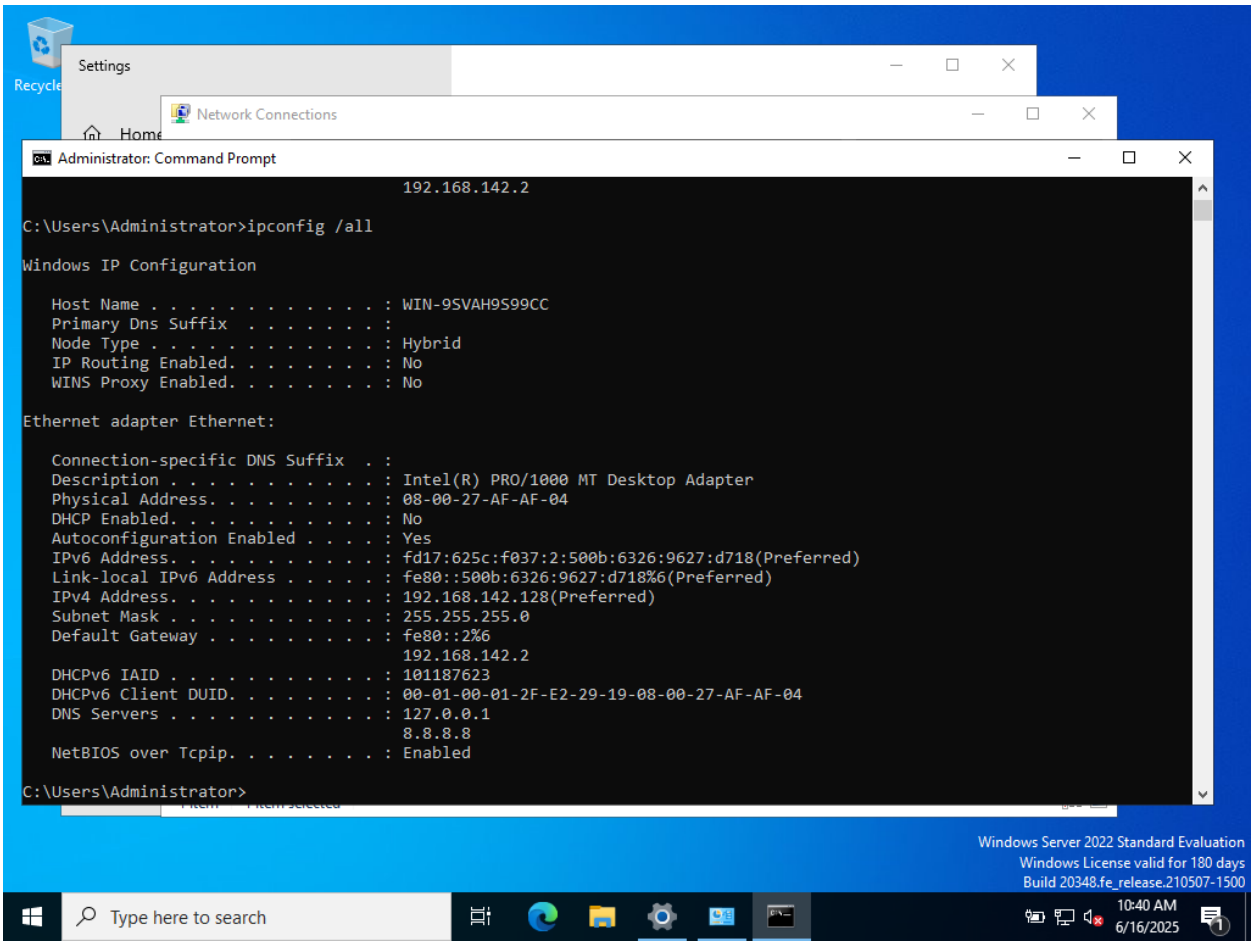
- **Domain Controller IP**: 192.168.142.128 (example)
- **Domain Name**:kali.local (example)
- **DNS Servers**: 127.0.0.1 (primary), 8.8.8.8 (secondary)
- **OU Structure**: Domain → USA → Users/Computers

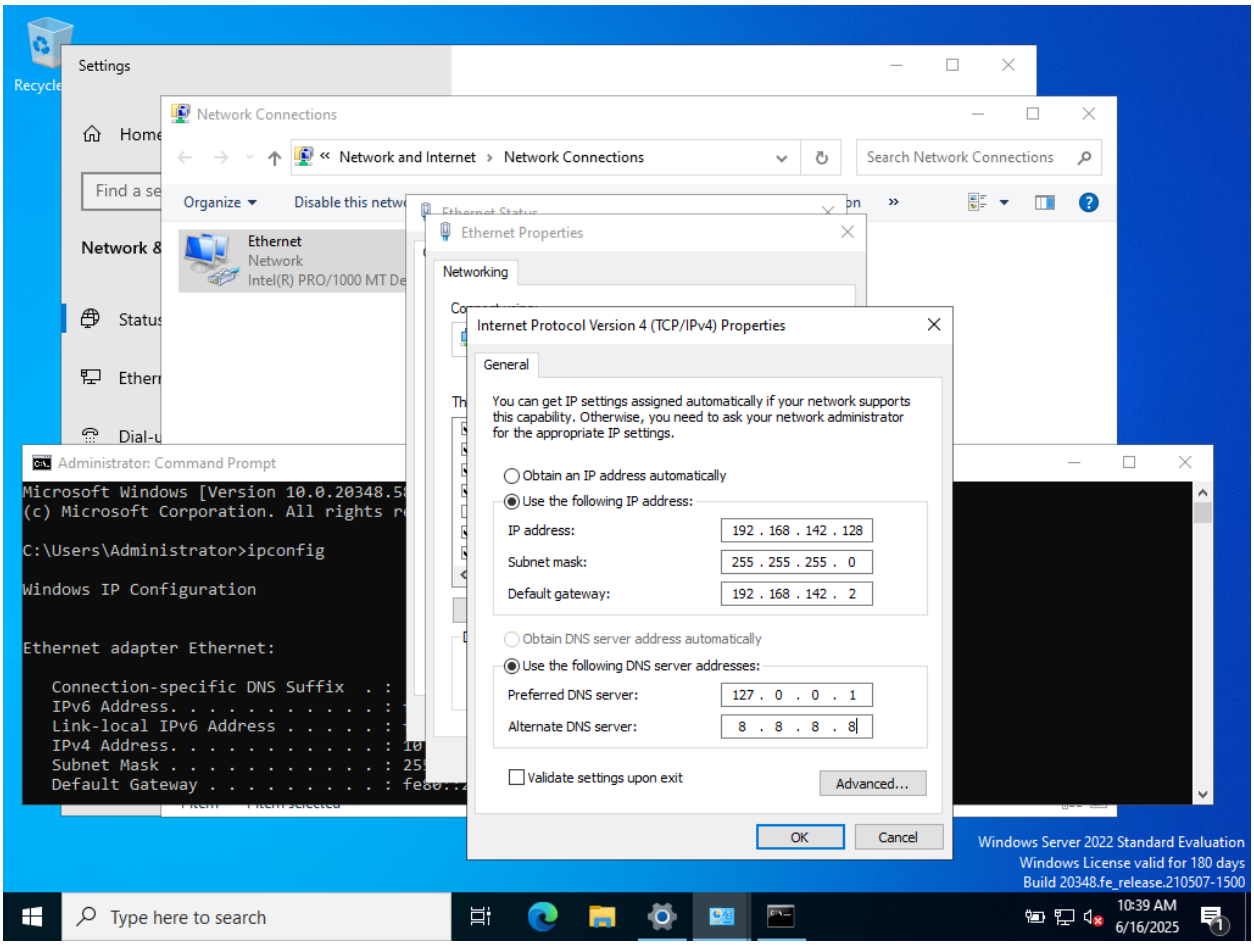
Command References

- **DNS Testing**: `nslookup domain.local`
- **Connectivity**: `ping domain-controller-ip`
- **Group Policy**: `gpupdate /force`
- **IP Configuration**: `ipconfig /all`

Documentation Standards

- All configurations documented with step-by-step procedures
- Screenshots and command outputs preserved for reference
- Troubleshooting procedures documented for knowledge transfer
- Security considerations documented for compliance review


Recycle
Settings
Network Connections
Administrator: Command Prompt
192.168.142.2
C:\Users\Administrator>ipconfig /all
Windows IP Configuration
Host Name . . . . . : WIN-9SVAH9S99CC
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
Ethernet adapter Ethernet:
Connection-specific DNS Suffix . :
Description . . . . . : Intel(R) PRO/1000 MT Desktop Adapter
Physical Address. . . . . : 08-00-27-AF-AF-04
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : fd17:625c:f037:2:500b:6326:9627:d718(Preferred)
Link-local IPv6 Address . . . . . : fe80::500b:6326:9627:d718%6(Preferred)
IPv4 Address. . . . . : 192.168.142.128(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::2%6
192.168.142.2
DHCPv6 IAID . . . . . : 101187623
DHCPv6 Client DUID. . . . . : 00-01-00-01-2F-E2-29-19-08-00-27-AF-AF-04
DNS Servers . . . . . : 127.0.0.1
8.8.8.8
NetBIOS over Tcpip. . . . . : Enabled
C:\Users\Administrator>
Windows Server 2022 Standard Evaluation
Windows License valid for 180 days
Build 20348.fe_release.210507-1500
Type here to search
10:40 AM
6/16/2025


Settings
Network Connections
Network and Internet › Network Connections
Search Network Connections
Organize
Disable this netw
Ethernet
Network
Intel(R) PRO/1000 MT De
Ethernet Properties
Networking
Internet Protocol Version 4 (TCP/IPv4) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 142 . 128
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 142 . 2
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server: 127 . 0 . 0 . 1
Alternate DNS server: 8 . 8 . 8 . 8
Validate settings upon exit
Advanced...
OK
Cancel
Administrator: Command Prompt
Microsoft Windows [Version 10.0.20348.5
(c) Microsoft Corporation. All rights r
C:\Users\Administrator>ipconfig
Windows IP Configuration
Ethernet adapter Ethernet:
Connection-specific DNS Suffix . :
IPv6 Address. . . . . :
Link-local IPv6 Address . . . . . :
IPv4 Address. . . . . : 10
Subnet Mask . . . . . : 25
Default Gateway . . . . . : fe80::
Windows Server 2022 Standard Evaluation
Windows License valid for 180 days
Build 20348.fe_release.210507-1500
Type here to search
10:39 AM
6/16/2025