IT INFRASTRUCTURE ADMINISTRATION

Mastering Microsoft SharePoint Server 2016: Comprehensive Infrastructure and Administration Guide (Exam 70-339)

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Microsoft SharePoint Server 2016 represents a significant milestone in the evolution of enterprise collaboration platforms. Unlike its predecessors, SharePoint 2016 was developed from a "Cloud-First" philosophy, leveraging the code base used for SharePoint Online within Microsoft 365. This architectural shift necessitates a profound understanding of both legacy on-premises configurations and modern, cloud-optimized deployment strategies. For IT professionals seeking the **MCSE: Productivity** certification, mastering **Exam 70-339: Managing Microsoft SharePoint Server 2016**is the definitive benchmark of expertise. This guide provides an in-depth technical analysis of the core technologies, configuration workflows, and management principles required to successfully deploy and maintain a robust SharePoint 2016 environment.

1. The Architectural Shift: MinRole and Infrastructure Design

One of the most transformative features introduced in SharePoint 2016 is **MinRole**. In previous versions, administrators often struggled with server consistency and determining which services should run on which nodes. MinRole simplifies this by allowing an administrator to specify the role of a server during farm join or configuration. SharePoint then automatically configures the necessary services and ensures that the server remains compliant with that role.

Defining MinRole Server Roles

The MinRole topology consists of several predefined roles, each optimized for specific workloads. Understanding these is critical for passing the 70-339 exam and for real-world capacity planning:

- Front-end: Optimized for low latency. This role handles user requests, web parts, and provides the user interface. It focuses on rendering pages and serving content to the end-user as quickly as possible.
- Application: Designed for high throughput. This role handles background tasks, service applications that do not require immediate user interaction, and intensive processing jobs.
- Distributed Cache: A dedicated role for the Distributed Cache service, which is essential for social features, authentication tokens, and performance optimization. In larger farms, separating this role prevents memory contention with other services.
- Search: Dedicated to the intensive indexing and querying tasks associated with the SharePoint Search Service Application.
- Specialized: Used for services that do not fit into the standard MinRole categories, such as third-party add-ons or specific niche service applications.
- Single-Server Farm: Designed for development, testing, or very small implementations where all services reside on one machine.

MinRole Compliance and Optimization

MinRole doesn't just deploy services; it monitors them. If a service that should be running on a Front-end server is stopped, the **SharePoint Health Analyzer**will flag it as non-compliant. Administrators can fix this with a single click in the Central Administration interface. This level of automation reduces the "configuration drift" often seen in

SharePoint 2013 environments.

Feature	Traditional (2013) Deployment	MinRole (2016) Deployment
Service Placement	Manual; prone to human error.	Automatic based on server role.
Scalability	Requires manual service instance management.	Predictable; simply add a role-specific node.
Performance	High risk of resource contention.	Optimized resource allocation per role.
Compliance	Requires custom scripts to monitor.	Native Health Analyzer integration.

2. Data Storage and SQL Server Integration

SharePoint 2016 is heavily dependent on **SQL Server** for its back-end storage. A deep understanding of database management is essential for a SharePoint Administrator. Specifically, the 70-339 exam focuses on the implementation of **SQL Server AlwaysOn Availability Groups**to provide high availability (HA) and disaster recovery (DR).

High Availability via AlwaysOn

Unlike legacy mirroring, AlwaysOn Availability Groups allow for multiple secondary replicas, which can be used for read-only workloads such as reporting or backups. This increases the return on investment for HA infrastructure. The connection string in SharePoint uses a **Virtual Network Name (VNN)**known as the Availability Group Listener, ensuring that if the primary SQL node fails, the SharePoint farm automatically fails over to the secondary node with minimal downtime.

Mathematical Model for Database Sizing

Calculating the required storage capacity for a SharePoint 2016 environment is not a guessing game. It requires a structured formula to account for various factors:

Total Storage = [(S * N) * (1 + V)] * I

- S: Average size of a single document.
- N: Estimated total number of documents.
- V: Versioning overhead (e.g., if you keep 10 versions, V might be 0.2 depending on delta storage).
- I: Indexing and metadata overhead (usually 15-20% or 1.2 multiplier).

For example, a farm with 1,000,000 documents averaging 2MB each, with standard versioning and metadata indexing, would require: **(2MB * 1,000,000) * 1.2 * 1.2 = 2.88 TB** of raw storage for content databases alone.

3. Identity Management and Authentication Protocols

Securing a SharePoint 2016 farm requires a sophisticated approach to identity management. The platform primarily uses **Claims-Based Authentication**. This allows for diverse identity providers, including Active Directory Domain Services (AD DS), SAML-based providers (like AD FS), and Forms-Based Authentication (FBA).

The Role of Kerberos and OAuth

While NTLM is the default, **Kerberos** is the recommended protocol for high-security environments and for scenarios involving "double-hop" authentication (where SharePoint must pass user credentials to a backend SQL or Power BI server). **OAuth 2.0** is also critical, particularly for **Server-to-Server (S2S)**authentication in hybrid

scenarios or when integrating with the SharePoint App Model.

Authentication Flow Comparison

Protocol	Use Case	Pros	Cons
NTLM	Internal, simple networks.	Easy to configure.	Performance lag; lacks delegation.
Kerberos	Large enterprises; BI.	High security; fast; supports delegation.	Complex SPN configuration required.
SAML (AD FS)	Federated access; Cloud.	Enables Single Sign-On (SSO) across domains.	Requires external infrastructure.
OAuth 2.0	Hybrid and App integration.	Modern standard; secure token-based.	Limited to app/service interaction.

4. Mastering the SharePoint Search Service Application

Search is arguably the most complex service application in SharePoint 2016. It is composed of several distinct components that must be carefully managed to ensure optimal performance and relevant results. The architecture is modular, allowing for significant scaling of individual components.

The Six Search Components

1. Crawl Component: Connects to content sources (web sites, file shares, SharePoint) and gathers data.
2. Content Processing Component: Transforms crawled items into a format the index can understand, performing language detection and entity extraction.
3. Analytics Processing Component: Analyzes user behavior (clicks, views) to improve search relevance and provides usage reports.
4. Index Component: The "heart" of the search engine. It stores the processed data and responds to queries. In SharePoint 2016, the index can be split into multiple partitions.
5. Query Processing Component: Receives queries from users, optimizes them, and retrieves results from the index.
6. Search Administration Component: Manages the overall configuration and health of the Search Service Application.

For the 70-339 exam, administrators must know how to use **PowerShell**to modify the search topology. For instance, moving an index component to a new server requires creating a new topology object, adding the component, and then activating the new topology.

5. Hybrid Integration: Bridging On-Premises and the Cloud

SharePoint 2016 was built to be a bridge to the cloud. Hybrid configurations allow organizations to maintain sensitive data on-premises while leveraging the power of Microsoft 365. Key hybrid features include:

- Hybrid Search: Using the Cloud Search Service Application, on-premises content is crawled and sent to the Office 365 index. Users get a single, unified search result set regardless of where the data resides.
- Hybrid Sites: Provides a unified "Following" list and a single profile for users across both environments.
- Hybrid OneDrive: Redirects users' on-premises OneDrive for Business links to their Office 365 personal sites, saving on-premises storage and providing better mobile access.

Implementation Procedure for Hybrid Search

1. Verify that the on-premises farm meets all prerequisites (Update levels, User Profile synchronization).

2. Configure Active Directory Synchronization (Azure AD Connect) to ensure identities match in both environments.
3. Establish a Server-to-Server (S2S) Trust using the SharePoint Hybrid Picker or manual PowerShell scripts.
4. Create the Cloud Search Service Application in Central Administration.
5. Configure the Cloud Search crawl and map the on-premises content sources.

6. Practical Field Guide: Troubleshooting and Performance Tuning

Operational excellence in SharePoint management requires a proactive approach to troubleshooting. The **Unified Logging Service (ULS)** is the primary source of diagnostic data. Administrators should be comfortable using **ULSViewer**to filter logs by Correlation ID, which is a unique GUID assigned to every request that passes through the farm.

Common Failure Modes and Solutions

- Performance Bottlenecks: Often caused by excessive "Large List" queries. Ensure that list view thresholds (default 5,000 items) are strictly managed and that columns are indexed appropriately.
- Search Crawl Stalls: Usually attributed to "iFilter" issues or network latency between the crawl component and the content source. Check the Crawl Log for specific error codes.
- Authentication Failures: In Kerberos environments, these are almost always due to missing or duplicated Service Principal Names (SPNs). Use the `setspn -L` command to verify configurations.

Optimizing the Distributed Cache

The Distributed Cache is notoriously sensitive. It is best practice to allocate no more than 16GB of RAM to the cache service on a single node, regardless of the total system RAM. Exceeding this can lead to long garbage collection pauses in the .NET framework, which negatively impacts site performance. Use the following PowerShell command to adjust the cache size:

Update-SPDistributedCacheSize -CacheSizeInMB 8192

7. Broader Implications of SharePoint 2016 Management

Successfully managing a SharePoint Server 2016 environment is not merely about technical configuration; it is about providing a stable, scalable, and secure platform for organizational knowledge. As digital transformation continues to accelerate, the ability to architect hybrid solutions and manage complex on-premises farms remains a critical skill set. The 70-339 certification path ensures that administrators are prepared to handle the intricacies of modern collaboration, from the nuances of MinRole deployment to the complexities of Cloud Search integration.

By adhering to the principles of high availability, rigorous performance monitoring, and secure identity management, IT professionals can ensure that their SharePoint infrastructure serves as a reliable backbone for business operations. Whether preparing for the exam or optimizing a live production environment, the technical depth provided in this guide serves as a foundation for achieving excellence in the field of Microsoft Productivity technologies. The move toward SharePoint 2016 is a move toward a more resilient, cloud-ready future, providing the flexibility required to meet the evolving demands of the modern enterprise.

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