HX Infrastructure Ansible Standards Compliance

Overview

This document outlines how the HX Infrastructure Ansible project adheres to official Ansible documentation standards and best practices as defined in the Official Ansible Documentation (https://docs.ansible.com/).

Compliance Areas

1. Variable Precedence and Organization

Reference: Ansible Variable Precedence (https://docs.ansible.com/ansible/latest/user_guide/playbooks_variables.html#variable-precedence-where-should-i-put-a-variable)

Implementation

- **Global Variables**: Stored in `inventory/group_vars/all.yml`
- **Environment-Specific Variables**: Stored in `inventory/environments/{env}/group_vars/all.yml`
- **Shared Libraries**: Organized in `inventory/group_vars/shared/`
- **Variable Precedence**: Follows official Ansible precedence rules

Structure

```
inventory/
├── group_vars/
│   ├── all.yml                    # Global variables (lowest precedence)
│   └── shared/                    # Shared variable libraries
│       ├── fqdns.yml              # FQDN definitions
│       ├── ip_addresses.yml       # IP address mappings
│       └── service_endpoints.yml  # Service endpoint configurations
└── environments/
    ├── production/
    │   └── group_vars/
    │       └── all.yml            # Production overrides (higher precedence)
    ├── staging/
    │   └── group_vars/
    │       └── all.yml            # Staging overrides (higher precedence)
    └── development/
        └── group_vars/
            └── all.yml            # Development overrides (higher precedence)
```

2. Inventory Structure

Reference: Ansible Inventory Best Practices (https://docs.ansible.com/ansible/latest/user_guide/intro_inventory.html)

Multi-Environment Support

- **Production**: `inventory/environments/production/hosts.yml`
- **Staging**: `inventory/environments/staging/hosts.yml`
- **Development**: `inventory/environments/development/hosts.yml`

Group Organization

- **Functional Groups**: `load_balancers`, `web_servers`, `application_servers`, `database_servers`
- **Zone-based Groups**: `dmz`, `private`, `management`
- **Service-based Groups**: `postgresql`, `redis`, `nginx`
- **Environment Groups**: `production`, `staging`, `development`

3. Configuration Management

Reference: Ansible Configuration Settings (https://docs.ansible.com/ansible/latest/reference_appendices/config.html)

ansible.cfg Compliance

- **Inventory Path**: Configurable per environment
- **SSH Settings**: Optimized connection parameters
- **Performance**: Pipelining, fact caching, parallel execution
- **Logging**: Centralized logging configuration
- **Security**: Vault integration, host key management

Key Settings

```
[defaults]
inventory = inventory/environments/production
gathering = smart
fact_caching = jsonfile
pipelining = True
roles_path = roles:~/.ansible/roles:/usr/share/ansible/roles

[ssh_connection]
ssh_args = -o ControlMaster=auto -o ControlPersist=60s
pipelining = True
```

4. Role and Collection Management

Reference: Ansible Roles (https://docs.ansible.com/ansible/latest/user_guide/playbooks_reuse_roles.html)

Role Path Configuration

- **Local Roles**: `roles/`
- **User Roles**: `~/.ansible/roles`
- **System Roles**: `/usr/share/ansible/roles`

Collection Management

- **Collections Path**: `~/.ansible/collections:/usr/share/ansible/collections`
- **Requirements**: Defined in `requirements.yml`

5. Security and Vault Integration

Reference: Ansible Vault (https://docs.ansible.com/ansible/latest/user_guide/vault.html)

Vault Configuration

- **Password File**: `~/.ansible_vault_pass`
- **Identity Management**: Support for multiple vault identities
- **Encryption**: Secrets encrypted at rest

Security Features

- **SSH Key Authentication**: Disabled password authentication
- **Host Key Checking**: Configurable per environment
- **Privilege Escalation**: Secure sudo configuration

6. Performance Optimization

Reference: Ansible Performance Tuning (https://docs.ansible.com/ansible/latest/user_guide/playbooks_strategies.html)

Optimization Features

- **SSH Pipelining**: Enabled for faster execution
- **Fact Caching**: JSON file-based caching with 24-hour TTL
- **Parallel Execution**: 20 forks for concurrent operations
- **Smart Gathering**: Conditional fact collection

Connection Optimization

- **Control Persistence**: 60-second SSH connection reuse
- **Connection Pooling**: Automatic control master management
- **Timeout Configuration**: Optimized timeout values

7. Logging and Monitoring

Reference: Ansible Logging (https://docs.ansible.com/ansible/latest/reference_appendices/logging.html)

Logging Configuration

- **Log Path**: `./ansible.log`
- **Callback Plugins**: `profile_tasks`, `timer`, `yaml`
- **Output Format**: YAML for better readability

Monitoring Integration

- **Task Profiling**: Execution time tracking
- **Performance Metrics**: Built-in timing callbacks
- **Debug Information**: Configurable verbosity levels

8. Multi-Environment Management

Reference: Managing Multiple Environments (https://docs.ansible.com/ansible/latest/user_guide/playbooks_best_practices.html#alternative-directory-layout)

Environment Separation

- **Inventory Isolation**: Separate inventory files per environment
- **Variable Overrides**: Environment-specific variable precedence
- **Configuration Flexibility**: Per-environment ansible.cfg support

Usage Examples

```
# Production deployment
ansible-playbook -i inventory/environments/production site.yml

# Staging deployment
ansible-playbook -i inventory/environments/staging site.yml

# Development deployment
ansible-playbook -i inventory/environments/development site.yml
```

9. Variable Organization Best Practices

Reference: Organizing Variables (https://docs.ansible.com/ansible/latest/user_guide/playbooks_variables.html#organizing-host-and-group-variables)

Shared Variable Libraries

- **FQDNs**: Centralized domain name management
- **IP Addresses**: Network topology definitions
- **Service Endpoints**: API and service URL management
- **Common Configuration**: Reusable settings across environments

Variable Naming Conventions

- **Descriptive Names**: Clear, self-documenting variable names
- **Namespace Prefixes**: Logical grouping with prefixes
- **Environment Suffixes**: Environment-specific variable identification

10. Documentation Standards

Reference: Ansible Documentation Guidelines (https://docs.ansible.com/ansible/latest/dev_guide/developing_modules_documenting.html)

Documentation Structure

- **README.md**: Project overview and quick start
- **Architecture Documentation**: Visual diagrams and explanations
- **Standards Compliance**: This document
- **Inline Comments**: YAML file documentation

Reference Links

All documentation includes direct links to relevant sections of the official Ansible documentation for easy reference and verification.

Validation and Testing

Syntax Validation

```
# Validate playbook syntax
ansible-playbook --syntax-check site.yml

# Validate inventory
ansible-inventory --list

# Check variable precedence
ansible-inventory --host <hostname> --yaml
```

Linting

```
# Run ansible-lint for best practices
ansible-lint .

# Check YAML syntax
yamllint .
```

Testing Framework

- **Molecule**: Role testing framework
- **Test Kitchen**: Infrastructure testing
- **Ansible Test**: Built-in testing tools

Continuous Compliance

Automated Checks

- **CI/CD Integration**: Automated syntax and lint checking
- **Pre-commit Hooks**: Local validation before commits
- **Documentation Updates**: Automatic documentation generation

Regular Reviews

- **Standards Updates**: Regular review of Ansible documentation updates
- **Best Practices**: Continuous improvement based on community standards
- **Security Updates**: Regular security best practices implementation

References

- Official Ansible Documentation (https://docs.ansible.com/)
- Ansible Best Practices (https://docs.ansible.com/ansible/latest/user_guide/playbooks_best_practices.html)
- Variable Precedence (https://docs.ansible.com/ansible/latest/user_guide/playbooks_variables.html#variable-precedence-where-should-i-put-a-variable)
- Inventory Best Practices (https://docs.ansible.com/ansible/latest/user_guide/intro_inventory.html)
- Configuration Settings (https://docs.ansible.com/ansible/latest/reference_appendices/config.html)
- Security Best Practices (https://docs.ansible.com/ansible/latest/user_guide/playbooks_best_practices.html#security)