GENERAL

cisco ise design guide

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Introduction

In today's hyper connected enterprise, securing the network perimeter has evolved far beyond simple password protection. Network access control (NAC) solutions that authenticate, authorize, and enforce policy for every device on the LAN are now essential. Cisco Identity Services Engine (ISE) is the industry leading NAC platform that delivers granular policy enforcement, guest access, and device profiling across wired, wireless, and VPN environments.

This **cisco ise design guide**walks you through every stage of a successful ISE deployment—from initial planning and architecture to post deployment optimization. Whether you're a network architect, security engineer, or IT manager, this guide will help you build a robust, scalable, and secure identity based network.

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1. Cisco ISE Overview

Cisco ISE is a policy platform that centralizes authentication, authorization, and accounting (AAA) for network devices. It leverages multiple protocols—802.1X, MAC authentication bypass (MAB), RADIUS, TACACS+, and more—to enforce consistent security policies across all endpoints.

Key capabilities include:

- Device profiling and classification
- Guest and BYOD onboarding
- Zero Trust network segmentation
- Dynamic policy enforcement via RADIUS attributes
- Integration with identity sources (AD, LDAP, RADIUS, SAML)
- Audit and reporting for compliance

2. Pre Deployment Planning

2.1 Define Business Objectives

Begin by articulating the business goals driving the ISE deployment. Typical objectives include:

- Improve network security posture
- Enable secure guest access
- Support mobile workforce with BYOD policies
- Meet regulatory compliance (PCI DSS, HIPAA, GDPR)
- Reduce operational overhead via automation

Document these goals in a **project charter** to guide all subsequent decisions.

2.2 Stakeholder Engagement

Secure buy in from all relevant stakeholders: network operations, security, compliance, HR, and end user support. Establish a steering committee to oversee the project timeline and budget.

2.3 Current Network Assessment

Conduct a thorough audit of the existing network:

- Inventory of switches, routers, access points, and firewalls
- Current AAA infrastructure (RADIUS, TACACS+, LDAP)
- Existing authentication methods (802.1X, MAB, MAC authentication)
- Guest and BYOD processes
- Compliance requirements and audit findings

This baseline will inform the ISE deployment size, topology, and integration points.

2.4 Capacity Planning

Estimate the number of concurrent authenticated devices, policy evaluation requests, and log volume. Cisco provides capacity calculators that help determine the number of ISE nodes required.

2.5 Budget & Procurement

Identify the total cost of ownership (TCO) including hardware, software licenses, and ongoing support. Consider whether to deploy on physical appliances, virtual machines, or a hybrid model.

3. Designing the Architecture

3.1 High Availability (HA) Topology

For production environments, a minimum of two ISE nodes in an active passive HA pair is recommended. For larger deployments, consider a three node cluster for load balancing and failover.

3.2 Redundant AAA Servers

Place ISE nodes behind a load balancer or use the built in HA to distribute RADIUS/TACACS+ requests. Ensure that the load balancer supports RADIUS keep alive and does not introduce latency.

3.3 Network Segmentation

Use virtual LANs (VLANs) or subnets to separate ISE traffic from user data. Typically, ISE communicates over the following ports:

- UDP 1812/1813 – RADIUS
- TCP 443 – HTTPS (management)
- TCP 22 – SSH (optional)
- TCP/UDP 1700 – TACACS+

Configure ACLs to allow only authorized switches, routers, and access points to reach the ISE nodes.

3.4 Integration Points

Map out integration with:

- Active Directory or LDAP for user authentication
- Network devices (Cisco, Juniper, Aruba, etc.)
- Guest portal servers (Cisco Guest Portal or third party)
- Endpoint security platforms (MDM, EDR)
- SIEM and logging solutions (Splunk, QRadar)

3.5 Security Zones

Deploy ISE in a demilitarized zone (DMZ) or a dedicated security segment. Apply strict firewall rules, enable intrusion detection, and monitor for anomalous traffic.

4. Deployment Phases

4.1 Phase 1 – Pilot Deployment

Start with a small pilot to validate architecture and policy logic:

1. Deploy two ISE nodes in HA mode.
2. Configure a subset of switches and access points.
3. Implement basic 802.1X and MAB policies.
4. Verify authentication flow and policy enforcement.
5. Collect performance metrics.

4.2 Phase 2 – Full Scale Rollout

Once the pilot is successful, expand to the remaining network segments:

- Incrementally add switches and APs.
- Implement additional policies (guest, BYOD, device compliance).
- Integrate with MDM for device posture checks.
- Configure reporting and audit logs.

4.3 Phase 3 – Optimization and Automation

Leverage ISE’s automation capabilities:

- Use the ISE API for dynamic policy updates.
- Integrate with configuration management tools (Ansible, Terraform).
- Automate onboarding of new devices via enrollment services.
- Implement self healing mechanisms for node failures.

5. Policy Creation and Management

5.1 Policy Elements

ISE policies consist of three core components:

1. Authentication – Determines how users or devices prove their identity.
2. Authorization – Determines what resources the authenticated entity can access.
3. Accounting – Tracks usage for auditing and billing.

5.2 Policy Types

Common policy types include:

- 802.1X policies for wired and wireless access.
- MAB policies for legacy devices.
- Guest policies with captive portals.
- BYOD policies with device compliance checks.
- Dynamic VLAN assignment based on user role or device type.

5.3 Policy Hierarchy

ISE processes policies in the following order:

1. Authentication policies
2. Authorization policies
3. Accounting policies

Use the **policy hierarchy editor** to manage policy precedence and avoid conflicts.

5.4 RADIUS Attributes and VLANs

Configure RADIUS attributes to assign VLANs, QoS, and other parameters. Example:

```
Attribute: 10 (Tunnel-Type) – 2 (VLAN)
Attribute: 32 (Tunnel-Medium-Type) – 6 (Ethernet)
Attribute: 33 (Tunnel-Private-Group-Id) – 100
```

Use the **ISE Policy Editor** to map these attributes to specific user groups.

5.5 Testing Policies

Use ISE's **Test Policy**feature to simulate authentication requests and verify the resulting RADIUS attributes. This reduces troubleshooting time after deployment.

6. Integrating with Existing Systems

6.1 Identity Sources

Integrate ISE with AD or LDAP for user authentication. Configure **Identity Source Groups**to allow ISE to query multiple directories.

6.2 Endpoint Management (MDM/EDR)

Connect ISE to MDM solutions to enforce device posture. ISE can query MDM for compliance status and apply corresponding policies.

6.3 Guest Portal Integration

Deploy Cisco Guest Portal or third party captive portal solutions. Configure ISE to provide authentication tokens and VLAN assignment post guest approval.

6.4 SIEM and Logging

Forward ISE logs to SIEM for correlation and alerting. Use syslog, SNMP traps, or the ISE API to push events.

6.5 Network Devices

Configure switches, routers, and APs to use ISE as the RADIUS server. Ensure that device firmware supports the required authentication methods.

7. Security Hardening

7.1 Network Segmentation

Place ISE in a secure zone and limit access to management interfaces.

7.2 Authentication and Encryption

Use TLS 1.2+ for management traffic. Configure RADIUS over TLS (RADsec) where possible. Ensure all passwords meet complexity requirements.

7.3 Role Based Access Control (RBAC)

Define roles such as **ISE Administrator**, **Policy Engineer**, and **Read Only Viewer** Grant the minimum privileges needed.

7.4 Patch Management

Keep ISE and its underlying OS up to date. Schedule maintenance windows and test patches in a staging environment before production rollout.

7.5 Backup and Disaster Recovery

Schedule regular backups of ISE configuration and database. Store backups in a secure, off site location. Test restore procedures periodically.

8. Performance and Scalability

8.1 Load Balancing

Distribute RADIUS/TACACS+ traffic across multiple ISE nodes. Use Cisco's built in HA or an external load balancer.

8.2 Caching

Enable authentication caching on network devices to reduce load on ISE during peak times.

8.3 Monitoring Metrics

Track key performance indicators (KPIs):

- Authentication request latency
- Concurrent authenticated sessions
- CPU and memory usage per node

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