Introducing Cisco ANA

About this chapter:

This chapter describes the Cisco Active Network Abstraction (ANA) platform and architecture. In addition, it provides a brief explanation of the terms used throughout this guide. The Cisco ANA Manage maintenance application is part of an overall Cisco solution; therefore, in order to better understand the Cisco ANA Manage environment, a brief overview of Cisco ANA is required.

The Cisco Solution, provides an overview of the Cisco ANA, its platform architecture and functional blocks.

Cisco ANA Components, describes the Cisco ANA system's key components.

Cisco ANA Manage Control Functionality, describes how Cisco ANA Manage serves as a tool to manage the Cisco ANA, which enables the addition, removal and modification of Cisco ANA information.

Additional Concepts and Terms, explains any additional terms used within the Cisco ANA Manage application and this guide.

Terminology and Conventions, describes the conventions used in the Cisco ANA Administrator's Guide. In addition, it provides a guide to related documentation.

The Cisco Solution

Cisco Active Network Abstraction (ANA) is a carrier class network management platform, designed to serve as an active mediation layer between the operation and the network layers. Cisco ANA provides a rich set of GUI easy to use applications as well as well-defined, APIs for Operation Support Systems, enabling carriers and service providers to efficiently respond to the constant market demand for new, reliable and more sophisticated services, while hiding the complexity of large, multi-vendor, multi-technology networks.

Cisco ANA provides solutions for diverse network environments and applications. It offers an integrated network and service auto-discovery for network modeling, intelligent fault analysis and a highly flexible network configuration and activation engine. This enables fully correlated management of global scale networks supporting millions of subscribers and customers.

Cisco ANA is a network management solution that provides a fully integrated service-oriented solution offering:

- Multi-vendor, hybrid device support
- Multi-Technology (IP, VPN, MPLS, Ethernet, ATM, DSL)
- Multi-function (Network discovery, Fault, Activation and Configuration)

- Vertical integration with multiple OSS/BSS applications

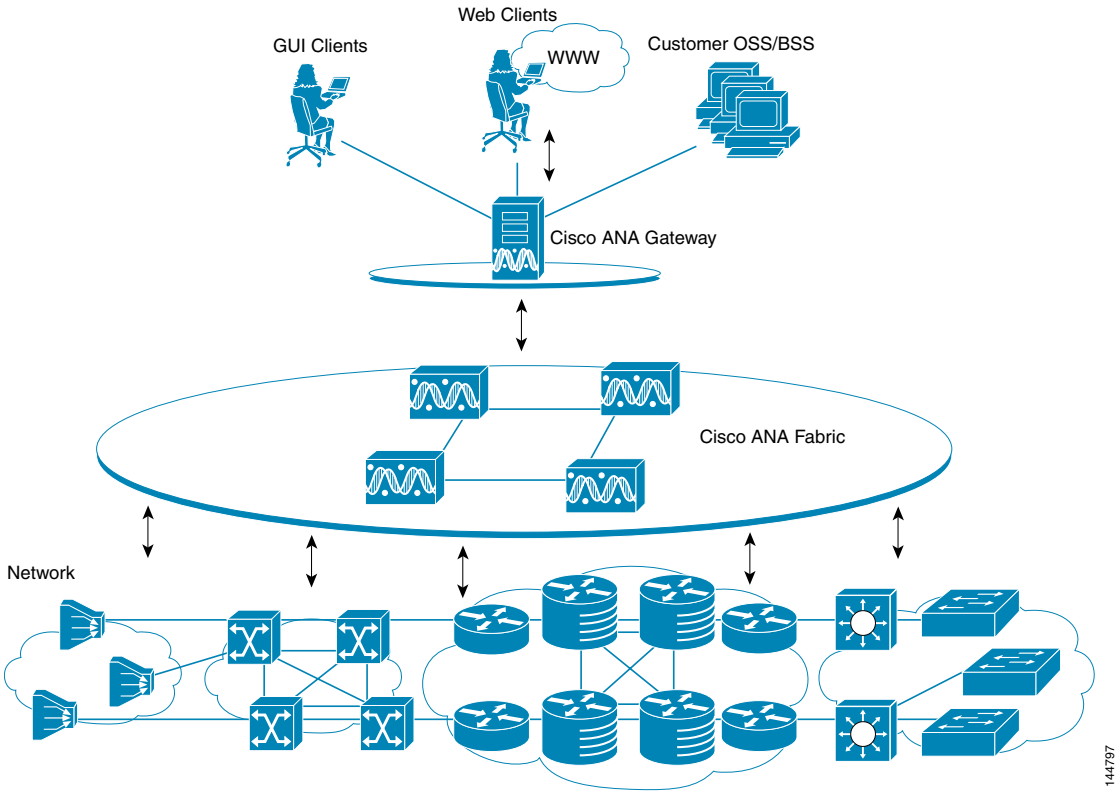
Based on a patented innovative architecture of Distributed Autonomous VNEs, Cisco ANA was designed from day one to enable integrated management, for hybrid network environments, while being extremely scalable in supporting network growth and evolution.

The Cisco ANA introduces key functional highlights such as:

- **Network (Horizontal) Integration—**supporting NEs from multiple vendors, across multiple technologies, forming a unified, end-to-end synthesis of the network
- **Network and Service Discovery, Real-time Inventory and Topology—**discovery of network inventory, services and multi-layer connectivity to form an accurate, up-to-date network information model
- **Network Fault Intelligence—**using the auto-discovered network model for fault correlation and root cause analysis
- **Service Impact—**the service impact analysis of various network faults showing affected VPNs and sites
- **Activation and Configuration—**a flexible, high-performance activation engine that supports virtually any device configuration required
- **Service Verification—**real-time verification of configuration health and consistency
- **Service Path Analysis—**dynamic isolation and tracing of service paths, end-to-end across technologies and network layers
- **GUI Client Applications—**a powerful set of user applications for Assurance, Fulfillment and Performance management
- **OSS/BSS (Vertical) Integration—**open, flexible northbound adaptation framework to OSS/BSS applications, in a wide variety of APIs, protocols and information models
- **Scalability—**a fully distributed solution implementing parallel processing that inherits the scaling properties of the network by creating a virtual model of it. Adding more Autonomous VNEs and/or more Cisco ANA Units easily supports network growth.

The Cisco ANA platform architectural diagram and functional blocks are displayed below.

Figure 1-1 Cisco ANA Architecture



Cisco ANA Components

The Cisco ANA system is comprised of several key components, as described in the sections that follow.

Autonomous VNE

The Autonomous VNEs (Virtual Network Elements) are software entities that run as a completely autonomous process within the Cisco ANA Units. Each VNE is assigned to manage a single Network Element (NE) instance using whatever southbound management interfaces the NE implements (e.g. SNMP or Telnet). The Autonomous VNEs are the entities that maintain a live model of each NE and of the entire network.

As the VNE loads, it starts investigating the NE and automatically builds a live model of the NE, including its physical and logical inventory, its configuration and its status. Following the device investigation, the VNEs begin to negotiate with peering VNEs, which represent the peering NEs determining the connectivity and topology at different layers. This model of the network topology, device state and device inventory is constantly being updated by the VNEs, which track every change that occurs in the NE or in the network.

Messaging between VNEs is used for running different end-to-end flows, in order to provide information for root cause and impact analysis, service path tracing and more.

The Cisco ANA Servers

Cisco ANA uses two distinct server types, each performing different activities:

- Cisco ANA Gateway
- Cisco ANA Unit

Cisco ANA Gateway

The Cisco ANA Gateway serves as the gateway through which all clients, including any OSS/BSS applications as well as the Cisco ANA clients can access the system. The gateway is an extended Cisco ANA Unit. It enforces access control and security for all connections and manages client sessions. In addition it functions as a repository for storing configuration, network and system events and alarms.

Another important function of the Cisco ANA Gateway is to map network resources to the business context. This enables Cisco ANA to contain information that is not directly contained in the network (such as VPNs and Subscribers) and display it to northbound applications.

Cisco ANA Unit

The main purpose of the Cisco ANA Units is to host the Autonomous VNEs. The Cisco ANA Units are interconnected to form a fabric of VNEs that can inter-communicate with other VNEs regardless of which unit they are running on. Each Cisco ANA Unit can host thousands of Autonomous VNE processes (depending on the server system size). The Cisco ANA Units also allow for optimal VNE distribution, ensuring geographic proximity between the VNE and its managed NE.

The clustered N+m high availability mechanism within the Cisco ANA Fabric is designed to handle the failure of a Cisco ANA Unit. Cisco ANA Unit availability is established in the Gateway, running a *Protection Manager* process, which continuously monitors all the Cisco ANA Units in the network. Once the *Protection Manager* detects a Cisco ANA Unit that is malfunctioning, it automatically signals one of the m servers in its cluster to load the configuration of the faulty unit (from the system Registry), taking over all its managed Network Elements. The switchover to the redundant standby Cisco ANA Unit does not result in any loss of information in the system, as all of the information is auto-discovered from the network, and no persistent storage synchronization is required. When a Cisco ANA Unit is configured it can be designated as being an active or standby unit.

For more information about high availability refer to the *Cisco Active Network Abstraction High Availability User's Guide*.

Cisco ANA Clients

Cisco provides a comprehensive suite of GUI applications to manage the network using the Cisco ANA platform.

- **Cisco ANA NetworkVision—**The main GUI application of Cisco ANA, used to visualize every management function supported by the system. For more information refer to the *Cisco Active Network Abstraction NetworkVision User's Guide*.
- **Cisco ANA EventVision—**A tool for viewing all historical events detected by the Cisco ANA system. For more information refer to the *Cisco Active Network Abstraction EventVision User's Guide*.
- **Cisco ANA Manage—**A system administration and configuration tool for managing the entire Cisco ANA platform, as described in this chapter.

- **Cisco Registry Editor—**A tool used for viewing and configuring the Cisco Registry.

The Cisco ANA Clients support automatic client updates from the Cisco ANA Gateway using Web Start. When connecting with a Cisco ANA Gateway application, the system verifies that the client version is the latest available and if an upgrade is required, the system automatically updates the Cisco Clients from the Cisco ANA Gateway.

Cisco ANA Manage Control Functionality

Cisco ANA includes extensive system administration functions for simple system control. Cisco ANA Manage is the GUI tool used for performing various system administration activities. It provides an interface to perform the following:

- **Cisco ANA Units—**Adding and removing Units.
- **Autonomous Virtual Machines (AVMs) and Virtual Network Elements (VNEs)—**Adding and removing AVMs and VNEs for the different Cisco ANA Units. Starting and stopping VNEs, and setting polling information per VNE.
- **Global Settings—**
  - **Clients Licenses—**Installing and managing Cisco ANA Client licenses
  - **DB Segments—**Viewing the storage allocated for all of the database segments
  - **Messages of the Day—**Generating a message of the day (service disclaimer)
  - **Polling Groups—**Customizing polling groups
  - **Protection Groups—**Customizing protection groups
- **Topology—**Managing static and persistent topology links.
- **Workflow Engine—**Enables the administrator to manage workflow templates and running workflows in runtime.
- **Scopes—**Enables the administrator to group a collection of managed Network Elements together in order to enable the user to view and/or manage the Network Elements based on the user's role.
- **Users—**Enables the administrator to define and manage user accounts.

Additional Concepts and Terms

The sections below include additional concepts and terms used in the Cisco ANA Manage application and throughout this guide.

AVM

The Cisco ANA Units are divided into AVMs (Autonomous Virtual Machines). These AVMs are Java processes that provide the necessary distribution support platform for executing and monitoring multiple VNEs. AVMs and VNEs should reside on a Cisco ANA Unit (as a common configuration) but they can also reside on a Cisco ANA Gateway.

There are some types of AVMs that run on the server which do not run VNEs. These AVMs have reserved ID numbers, namely, AVM 0-100 and these cannot be used. In addition, there are other reserved AVM ID numbers. The following AVMs have special roles assigned to them, namely:

- AVM 0 (the switch AVM)

- AVM 11 (the Gateway)
- AVM 66 (the workflows AVM)
- AVM 99 (the management AVM)
- AVM 100 (the trap management AVM)

Device/Network Element

A network component existing in the network, for example, the devices displayed in Cisco ANA and in Cisco ANA NetworkVision.

Element Management

The base configuration for the creation of the managed element. Cisco ANA Manage enables the user to create VNEs, for example, by entering the IP address, SNMP and polling rate information and so on. This is called **Element Management**.

License

Cisco ANA Client applications and BQL connectivity is based on installed license files. Cisco ANA Manage enables the administrator to control and monitor the number of Cisco ANA Client and BQL connections over a limited or unlimited period of time based on the client licenses installed. Two types of licenses are supported, namely, fixed (the number of installed users are identified by user names or IP addresses or both) or floating (the number of installed users operating concurrently).

Managed Element

After Cisco ANA Manage installs and runs the process, samples the device and collects the data a VNE (**Managed Element)** is created. The VNE includes logical inventory (tables, for example, forwarding tables) and physical inventory (for example, modules and ports), and this **Managed Element** can be accessed using Cisco ANA NetworkVision.

Network Element Components

Component(s) of a Network Element (NE), such as port(s), blade(s), context(s) and so on.

Permission

The user's ability to perform certain tasks. There are two types of permissions, namely, default and NE related.

- **Default—**The default permission only applies to the activities that are related to GUI functionality, not the activities related to Network Elements. For example, a user with the default permission Viewer can view maps and the Device List. For more information see the Default Permissions section.

- **Network Element—**The NE related permission enables the administrator to group a collection of managed Network Elements together (in Cisco ANA Manage) in order to enable the user to view and/or manage the NEs based on the user's role or permission. After the user is allocated a scope (list of Network Elements) and a role, the user can then perform various activities on the Network Elements, for example, manage alarms in Cisco ANA NetworkVision. For more information see the Scopes section.

Polling Group

A polling group is defined as a group of polling rates that can be specified for a device. For more information see the Polling Groups Overview section.

Protection Group

A Protection Group is a cluster to which Units and Standby Units are related. In case of Unit failover then the Redundant Unit will be taken from the same Protection Group.

Redundant Unit

The Cisco ANA Unit comes with built-in redundancy for maximum up time and automatic switching. A threshold configurable watchdog constantly monitors the Cisco ANA Units and Cisco ANA Gateway and can make an automatic or manual (operator approved) switch over when there is no response from the monitored entity. The system is always up-to-date via real time investigation of the network. The redundancy mechanism ensures synchronization of the active and backup Cisco ANA units. Once activated, the standby Cisco ANA node is immediately synchronized with the network.

Roles

Cisco ANA implements a security engine that combines a role-based security mechanism that is applied on scopes of Network Elements granted per user. The system supports user accounts creation, multiple Network Element scope definition and a set of five pre-defined roles for security and access control to allow different system functions:

- **Administrator—**Manage the system configuration and security.
- **Configurator—**Activate services, and configure the network.
- **Operator Plus—**Able to fully control alarm life cycle and create maps.
- **Operator—**Configure business tags and perform most day-to-day operations.
- **Viewer—**Read only access to the network and to non-privileged system functions.

Roles can be granted per scope or at an application level (default permission), namely, all the activities that are related to GUI functionality, not the activities related to devices. The default permission includes:

- Application login.
- Manage alarms in Cisco ANA NetworkVision.
- Manage maps—Creating, deleting, and opening.
- Map manipulation—Arrange map, including, aggregations, adding NEs, NEs placement in map, map background and so on.
- Business tag management.

Scopes

A scope is a named collection of managed Network Elements that have been grouped together in order to allow a user to view and/or manage the Network Elements provided a given role. Grouping can be based on geographical location, Network Element type (such as DSLAM, router, SW, etc.), Network Element category (such as access, core, etc.) or any other division according to the network administrator's requirements.

Using NetworkVision, a user that has been assigned a scope can view and/or manage the NEs within this scope according to the role assigned to the user as per the scope. The user cannot view any information regarding NEs that are outside the user's scope, including basic properties, inventory, and alarms.

Static Link

A static link is a physical link that is not automatically discovered by the system. The user manually creates the static link between Network Elements by selecting the two end ports from the NE's physical inventory.

Transport Link

A transport link is a logical link used for communication between the units and for transferring information.

Users

In order for a user to work with Cisco ANA the following requirements must be met:

- The user must have a valid license installed.
- The user must have a defined Cisco ANA user account.
- The user must have an assigned permission.

For more information about users see the Managing Cisco ANA Security section.

Workflow

A workflow consists of several tasks grouped together and arranged in a flowchart. All workflows are stored on the Cisco ANA Gateway. After a workflow is deployed, it is accessible using Cisco ANA Manage in order to view properties and status. Deployed workflow templates can be invoked via the Cisco ANA API using BQL. In addition, the user can view a history of the invoked workflows using Cisco ANA EventVision. For more information refer to this guide and the *Cisco Active Network Abstraction Workflow User's Guide*.

Terminology and Conventions

This Cisco ANA Administrator's Guide uses the following conventions:

Convention	Description
^ or Ctrl	The ^ and Ctrl symbols represent the Control key. For example, the key combination ^D or Ctrl-D means hold down the Control key while pressing the D key. Keys are indicated in capital letters but are not case sensitive.

Command syntax descriptions use the following conventions:

Convention	Description
boldface	Boldface text indicates commands and keywords that the user enters literally as shown.
italics	Italic text indicates arguments for which the user supplies values.
[x]	Square brackets enclose an optional element (keyword or argument).
|	A vertical line indicates a choice within an optional or required set of keywords or arguments.
[x | y]	Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice.
{x | y}	Braces enclosing keywords or arguments separated by a vertical line indicate a required choice.

Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. For example:

Convention	Description
[x {y | z}]	Braces and a vertical line within square brackets indicate a required choice within an optional element.

Examples use the following conventions:

Convention	Description
`screen`	Examples of information displayed on the screen are set in Courier New font.
Boldface screen	Examples of text that the user must enter are set in Courier New bold font.
< >	Angle brackets enclose text that is not printed to the screen, such as passwords.
[ ]	Square brackets enclose default responses to system prompts.
{ }	Curly brackets group mandatory parameters together where there are options.

Related Documentation

For more detailed information see the following publications:

- *Cisco Active Network Abstraction NetworkVision User's Guide*
- *Cisco Active Network Abstraction EventVision User's Guide*
- *Cisco Active Network Abstraction Servers Installation Guide*
- *Cisco Active Network Abstraction Client Installation Guide*
- *Cisco Active Network Abstraction High Availability User's Guide*
- *Cisco Active Network Abstraction Error Messages*
- *Cisco Active Network Abstraction Workflow User's Guide*