



Application Enablement Services

Overview

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An Avaya MultiVantage[®] Communications Application

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Chapter 1: What is Application Enablement Services?

Intended audience

This book is intended for telecom managers, systems engineers, architects, application developers, and IT managers who already have knowledge of the capabilities of Communication Manager and the software needs of their organization that Application Enablement Services might fulfill. This book can help you decide:

- Whether your organization should use Application Enablement Services to develop Communication Manager-based applications
- What kinds of applications to develop
- Which services provided by AE Services will meet your application development needs
- Which AE Services offer is appropriate for you - Bundled Server or Software-Only

Application developers should also read this book before starting to develop an application, as this book provides an overview of the capabilities of the SDKs.

Overview of AE Services

AE Services provides an enhanced set of Application Programming Interfaces (APIs), protocols, and web services that expose the functionality of Avaya Communication solutions to corporate application developers, third-party independent software vendors, and system integrators. As an open standards-based solution, AE Services runs on a Linux server and is tightly integrated with Avaya Communication Manager and Avaya solutions.

In addition to providing an array of existing APIs and protocols (JTAPI/TSAPI, CVLAN, and DLG), AE Services also provides the Device, Media, and Call Control API (formerly known as CMAPI) and Web services (such as Systems Management Web Service, the Telephony Web Service, and the User Service), which are geared toward promoting interoperability between management applications and business processes.

TR/87 implementation (new for AE Services 4.0)

As of R4.0, AE Services provides a TR/87 implementation that allows customers to integrate with a Microsoft Live Communications Server (LCS). The AE Services TR/87 implementation enables users to launch and answer phone calls from the Microsoft Office Communicator application using the Microsoft Live Communications Server.

A new license, the Unified Desktop license, supports the AE Services - LCS integration. For more information about this license, see [Licensing for integration with Microsoft LCS 2005](#) in [Chapter 7: AE Service licensing](#).

For more information, see the *Avaya Multivantage Application Enablement Services TR/87 Implementation Guide*.

Services provided by AE Services

These types of services are provided by AE Services:

- Device, media, and call control service (CSTA III)
- Web services
- Call control services provided by TSAPI, JTAPI, CVLAN, and DLG

These types of services are explained in the following sections.

Device, Media, and Call Control service (CSTA III)

The Device, Media, and Call Control service provides the following functionality:

- Device control
- Media control
- Call information
- (Limited) Call control

These services are provided by these APIs:

- Device, Media, and Call Control XML API
- Device, Media, and Call Control Java API
(Includes the Media Stack Java API)

Device control functionality

The device control services allow you to:

- Instantiate a Device, Media, and Call Control softphone (DMCC softphone) that gains exclusive or shared control of a softphone-enabled Communication Manager telephone/extension.

Note:

A *DMCC softphone* is a software instantiation of a phone or extension that is created using AE Services and registered on Communication Manager.

- Activate or control some of a DMCC softphone's physical elements (for example, change button display lamps, change hookswitch status, and press buttons)
- Determine the status of a DMCC softphone's physical elements (for example, status of button display lamps, hookswitch and message waiting indicator, ringer)
- Detect events on a DMCC softphone's physical elements (for example, events on the displays, lamps, and the ringer)
- Detect out-of-band DTMF digits

What is Application Enablement Services?

Media control functionality

Device, Media, and Call Control provides the functionality available through the Real-time Transport Protocol (RTP) media streaming connection. RTP is an internet protocol for transmitting real-time data such as audio and video.

The media control services allow you to:

- Record media from a call into a WAV file
- Dub a recording with the contents of another compatible WAV file
- Play a voice announcement or tone that is prerecorded in a WAV file
- Play a list of announcements, prerecorded in separate WAV files
- Stop, pause, or resume outstanding play or record operations
- Detect DTMF digits
- Manage service event listeners
- Originate and terminate RTP streams on the application machine

Call Information Services

- Provide detailed call information, for example, Call ID, Universal Call ID
- Determine the status of the call information link

Call Control functionality

- Set up single-step conferencing
- Provide information about each endpoint of a given call
- Provide information about each call on a given device

Web services

Web services are self-contained, platform-independent modular services that can be described, published, located, and invoked over any IP network. AE Services provides three Web services. Each service has its own Web Services Definition Language (WSDL).

For more information about the Web services, see the *Avaya MultiVantage Application Enablement Services Web Services Programmer's Guide*.

Telephony Web Service

Enables high-level call control functionality over standard Web Services interfaces (SOAP/XML). Telephony Web Service requires the TSAPI Service. This service allows you to:

- Make a call
- Transfer a call
- Conference a call
- Disconnect a call
- Answer a call

Telephony Web Service hides the complexity of call control. For example:

- All operations are independent.
- The client application does not need to deal with connections or call identifiers. The only parameters required are extension and telephone numbers.
- The client application can add a party to a call using the conference request even if the call was not originally established through the Telephony Web Service.

System Management Service

Allows you to display, list, add, change, or remove specific managed objects on Communication Manager.

User Service

Enables a single, shared user identity concept for users of Avaya communication services and applications and integration with Identity Management systems.

- Enables an automated, bidirectional integration with an enterprise Identity Management system
- Provides a single point of user authentication across Avaya products and platforms

Call control services

The AE Services Call Control services are provided by the following APIs and protocol.

- TSAPI C/C++ CSTA I Call Control API
- JTAPI Java Call Control API
(Includes JTAPI 1.4 Observer only)
- CVLAN C/C++ Call Control API
- DLG Call Control Protocol

The call control services expose third-party call control functionality that provides the ability to:

- Control and interact with calls that undergo vector processing, predictive dialing/call classification, or skills-based routing
- Detect and answer incoming calls
- Screen calls
- Log calls
- Make outbound calls and use call classification to determine when the calls have been answered
- Disconnect calls
- Transfer calls
- Set up conference calls or perform single-step conferencing
- Hold, retrieve, or divert calls

- For a given device, take a snapshot of:
 - the calls on the device
 - the parties on the calls
- Perform routing services
- Perform logical services (agent logon/logoff)

The SDKs provided by AE Services

- Device, Media, and Call Control XML SDK
- Device, Media, and Call Control Java SDK
(Includes the Media Stack API)
- Telephony Web Service SDK
- User Web Service SDK
- System Management Web Service SDK
- TSAPI SDK
- JTAPI SDK
- CVLAN SDK

AE Services also provides an ASAI/DLG protocol.

Customers can choose which SDKs to download and install

Note:

Use of the SDKs with the AE Services platform is subject to licensing.

Types of applications that can be developed

AE Services supports a variety of telephony-enabled applications. It can support voice control applications that allow the user to manage and control incoming and outgoing calls at the desktop or more complex applications for the office work group or call center environment. Applications can provide a variety of features to enhance user telephone control from the client workstation. Application features may include:

- Call management
- Call screening
- Call logging
- Directory dialing from personal (client), workgroup (server), and corporate directories
- Dialing and integration with other applications
- Integration of message waiting indicator for email or other messaging applications

Besides the telephony-enabled applications, AE Services can be used to create many types of Device, Media, and Call Control applications, for example:

- Messaging applications
- Specialized console applications for targeted markets such as hospitality, health care, and tenant services
- IP call recording applications
- Interactive voice response (IVR) applications
- Call logging applications

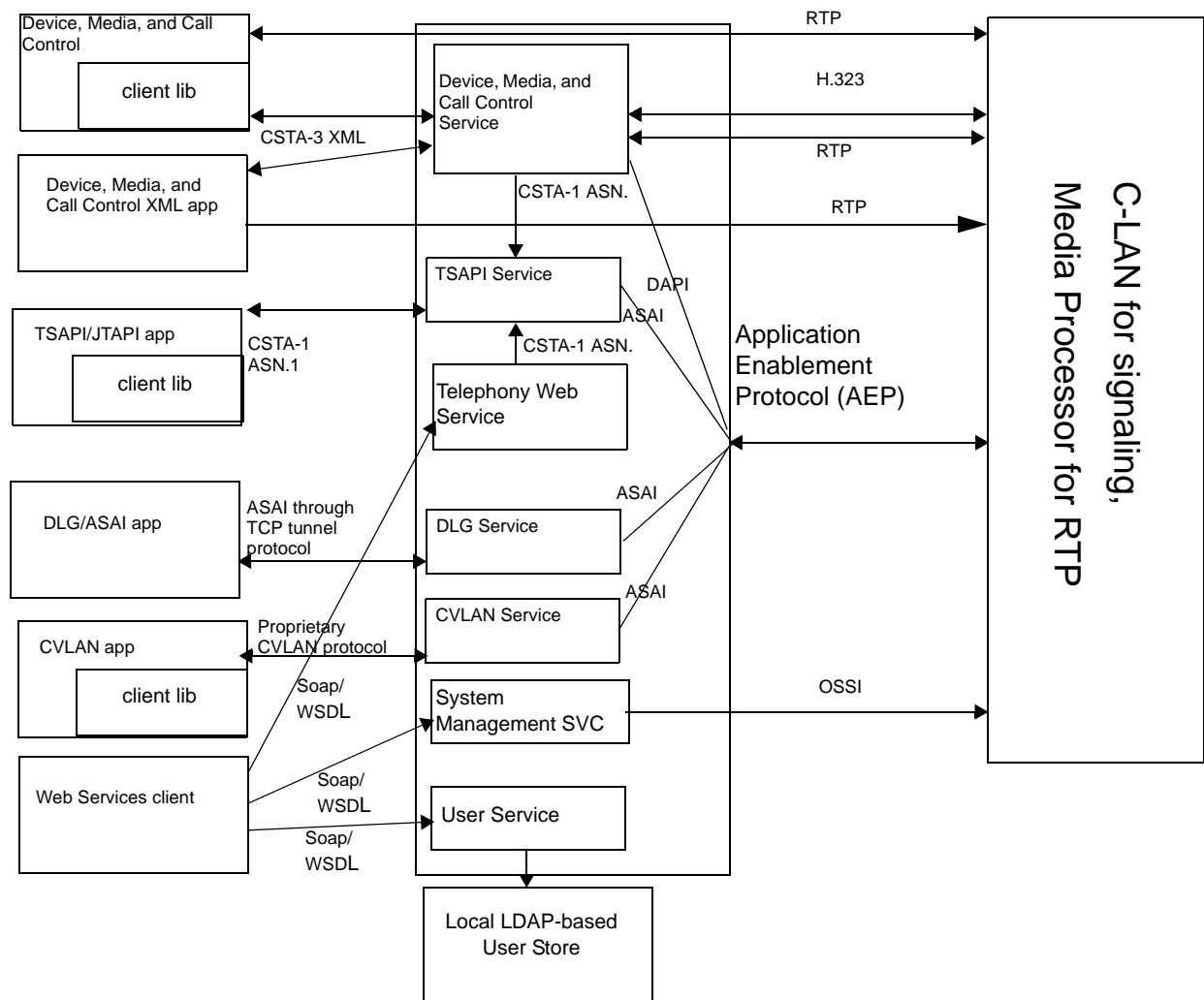
Example applications

- **IP call recording** applications can provide the ability for end users to record phone conversations by pressing a pre-administered button on their IP phone. The IP call recording application can be developed for various types of recording, for example, multi-user call recording, executive call recording on demand, malicious call recording.
- **IP softphone** applications can be developed that run on users' Windows desktop. An application can take exclusive control of the users' regular telephone extensions so that they can make and receive calls from their PCs and have the audio streamed to/from their PC speaker/microphone. Alternatively, using shared control, an application can allow the user to make and receive calls from their regular telephone using their PC to control that phone.
- **Interactive voice response (IVR)** applications can be created for businesses such as banks or customer service centers. These IVR applications could perform such tasks as detecting button pushes by a caller, playing recordings, and recording conversations. For example, callers might be presented with options such as recording a message or being transferred to another extension. The callers select the preferred option by pressing the specified button on their telephone
- **Click-to-call** applications can be created that perform directory lookups. Applications can provide helpful GUIs, such as a call log GUI to return a call and/or a directory lookup GUI to make a call.
- **Terminal display** applications can be created that allow end users to view weather reports, news alerts, or stock tickers via their IP phone display.
- **Customer service** applications can allow agents to interact with both the "telephony" and "caller database" aspects of the job.
- **Graphical user interface (GUI)** applications can include caller information on a "screen pop" at agents' PCs.
- **Voice and data integration** - Any server on the network (PC, mini-computer, or mainframe) can contain a caller database. The application integrates access to all the different information (voice and data) needed to support an inbound customer service center.
- **Call routing** applications can request that the server provide a destination for incoming calls. Applications may also request outbound calls for Outbound Call Management (OCM) applications such as predictive dialing.

Client application view

[Figure 1](#) illustrates the libraries used by the clients (if any), the protocols used between the clients and the various services, and the protocols used between AE Services and Communication Manager.

Figure 1: Client application view



Chapter 2: Services provided by the APIs

This chapter lists the services provided by the AE Services APIs. It also provides an overview of the capabilities of Device, Media, and Call Control.

Note:

Information about the CSTAI/ASAI services (TSAPI/JTAPI/CVLAN/DLG) is contained in other books that are included as part of this document set. But the books created for AE Services are the only sources of information for Device, Media, and Call Control. Thus, this section contains more explanation of the capabilities of Device, Media, and Call Control than of the capabilities of TSAPI/JTAPI/CVLAN/DLG.

Overview of Device, Media, and Call Control Capabilities

Control modes

Both physical devices and DMCC softphones can be controlled from the Device, Media, and Call Control APIs. Calls are made and received on these devices by controlling and observing the physical aspects of the softphone of the device, such as:

- Pressing buttons
- Going off and on hook
- Observing the lamps, ringer, and display

Registering a device gives the application either exclusive or shared control of the device:

- **Exclusive control mode** gives all control of the device to the application including control of the media stream. Exclusive control must be used by applications that need to do any of the following:
 - Record media with Voice Unit Services
 - Play announcements or messages with Voice Unit Services
 - Detect or collect DTMF tones with Tone Detection Services or Tone Collection Services

Note:

Call progress tone detection (for example, dialtone, busytone, ringback) is *not* supported.

- Control the media

Services provided by the APIs

An application may take exclusive control of either:

- A physical telephone's extension

or

- An extension that has no physical telephone associated with it

- **Shared control mode** gives control to both the telephone and the application. Shared control must be used by applications that need to monitor and control a physical telephone.

In shared control mode:

- An application may take shared control of only a physical telephone, not an extension without hardware.
- No media is delivered to the DMCC softphone.

For more information about shared control and exclusive control, see the section “Registering Devices,” in the chapter “Writing a client application” in:

- *Avaya Application Enablement Services Device, Media, and Call Control Java Programmer Guide*

or

- *Avaya Application Enablement Services Device, Media, and Call Control XML Programmer Guide*

Controllable telephone types

Device, Media, and Call Control can control any Communication Manager DCP or IP telephones and extensions when they are administered for softphone access.

For more information about telephone types controllable by Device, Media, and Call Control, see the section, “Controllable telephone types,” in Chapter 3, “Writing a client application,” in either of these books:

- *Avaya MultiVantage Application Enablement Services Device, Media, and Call Control Java Programmer Guide*

or

- *Avaya MultiVantage Application Enablement Services Device, Media, and Call Control XML Programmer Guide*

Call model for Device, Media, and Call Control

Using the APIs, the application first registers a device as a Communication Manager telephone/extension. In the application, device IDs are used to represent softphone-enabled Communication Manager telephones or extensions. This registration can be exclusive-control mode or shared-control mode. (See [Control modes](#) on page 17 for explanations of these control modes.) The application can then perform telephone operations on the device. This in turn causes the AE Services server to make requests of Communication Manager to perform those operations. In shared-control mode, Communication Manager treats these operations as though they came from the associated physical telephone.

Communication Manager asynchronously notifies the AE Services server of any event that occurs on the telephone or extension, such as when a lamp becomes lit. The AE Services server then notifies the application of the event. In shared-control mode these events are sent to both the AE Services server/application and the associated physical telephone.

The telephony operations are performed on the softphone. For example, a button press request from the application means that the application wishes to simulate a button press on the softphone, and a display updated event from Communication Manager indicates to the application that the softphone display has changed. An application can:

- Make calls from the softphone
- Receive calls at the softphone
- Record media coming into the softphone (only in exclusive control - server media mode/client media mode)
- Play announcements from the softphone (only in exclusive control - server media mode)
- Play tones from the softphone (only in exclusive control - server media mode)
- Detect digits coming into the softphone
- Redirect the softphone's media (only in exclusive control)

Note:

When performing these operations in shared-control mode, the application affects both the softphone and the physical device.

[Figure 2: Message types using the Java API](#) on page 20 shows the various types of messages used within the AE Services server when using the Java API library.

[Figure 3: Message types using the XML protocol](#) on page 20 shows the various types of XML requests used within the AE Services server when using the XML protocol.

Figure 2: Message types using the Java API

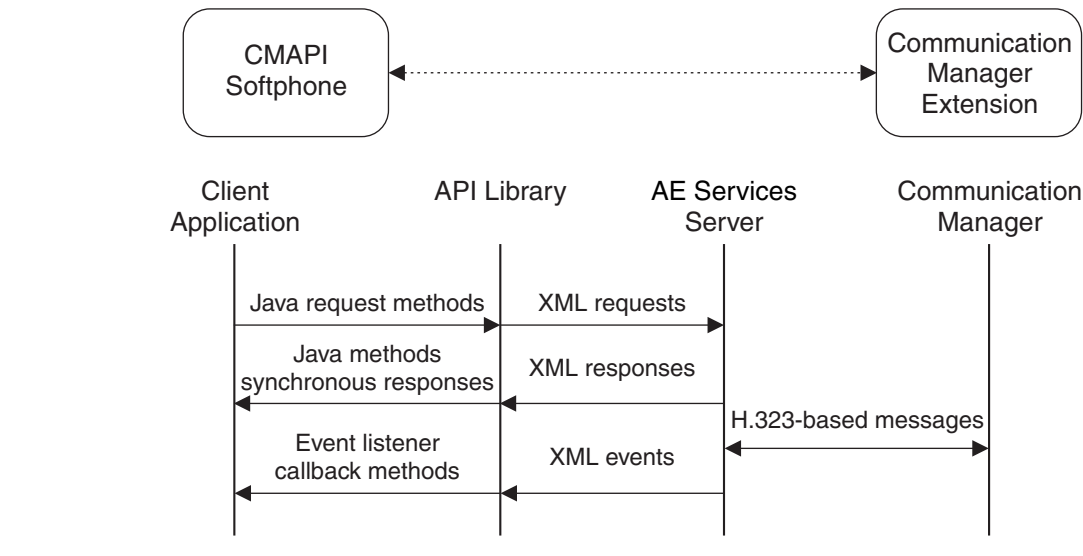
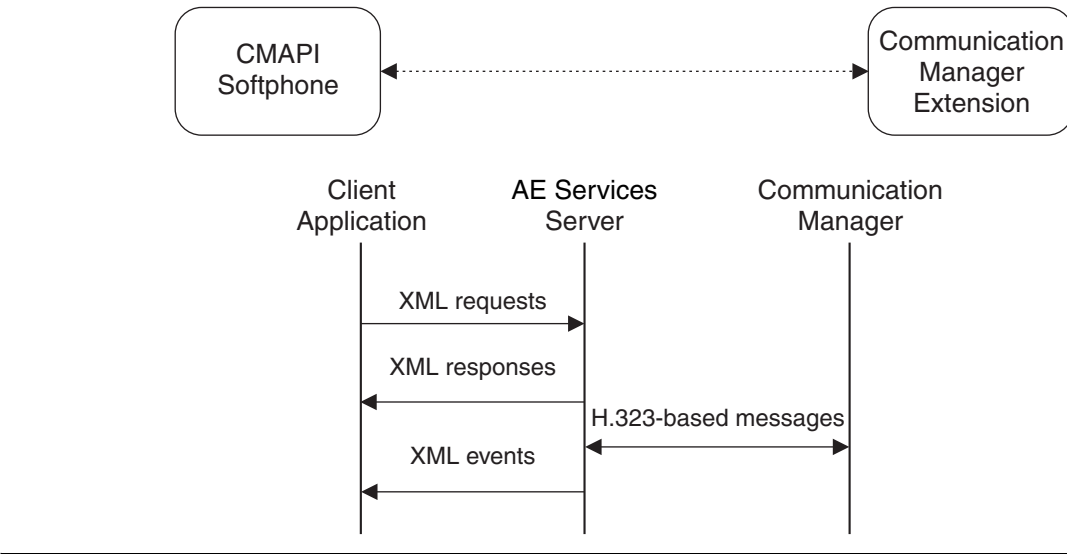


Figure 3: Message types using the XML protocol



For more specific call flow diagrams for Device, Media, and Call Control, see the Device, Media, and Call Control programmer guides.

CSTA III standard architecture

Device, Media, and Call Control supports the ECMA telephony standard called Computer Supported Telecommunications Applications (CSTA) Phase III. This standard is specified in publication ECMA-269, Services for Computer Supported Telecommunications Applications (CSTA) Phase III, 5th Edition, December 2002 found at <http://www.ecma-international.org>. The Java API library provides a Java-binding to a subset of the CSTA XML protocol whose specifications can be found in publication ECMA-323, XML Protocol for Computer Supported Telecommunications Applications (CSTA) Phase III, 2nd Edition, December 2002. The XML protocol provides the supported XML subset directly to the application.

CSTA specifies a standard applications interface and XML protocol for OSI Layer 7 communication between a computing platform (such as your application) and a telecommunications network (such as Avaya Communication Manager).

CSTA III Services and Avaya extensions for Device, Media, and Call Control

This section provides an overview of the CSTA III services that the Device, Media, and Call Control SDKs support and the extensions that Avaya has implemented.

These services include:

- Device registration and control
- Call recording and message playing
- DTMF digit detection and collection
- A small number of call control and snapshot services

These services are provided through a Java API interface or the XML protocol. Some of the interfaces conform to the CSTA III standard (ECMA-269) and some are Avaya extensions to the CSTA standard.

For more detailed information about the supported CSTA Services and the Avaya extensions, see the programmer guides and the programmer references (Javadoc and XMLdoc).

The CSTA III events and the events provided by Avaya are not listed here. For lists and explanations of all of the services and events provided, see the programmer guides and the programmer references (Javadoc and XMLdoc).

CSTA III Services provided by Device, Media, and Call Control

In CSTA, each service is defined to be a request that either comes from the application to the switch or comes from the switch to the application. The Device, Media, and Call Control APIs, however, are based on a client/server model where the application is the client and the AE Services server software and the switch together act as the server. Thus, these APIs:

- allow an application to request services of a switch
- allow an application to request notification of asynchronous events on the switch

The following sets of CSTA services are supported in the Device, Media, and Call Control APIs and are described in the programmer's guides and the programmer's references (Javadoc and XMLdoc)

Table 1: Supported CSTA III Services

| Sets of supported CSTA services | Provides ability to |
|---|--|
| Application Session Services (XML only) | Establish and maintain a session between an application and the server |
| Physical Device Services | Monitor and control physical aspects of a device |
| Voice Unit Services | Record messages coming to a device and play messages from a device |
| Monitoring Services | Request notification of events that occur on a device |
| Call Control Services | Add a device into an existing call |
| Snapshot Services | Obtain information about calls on a given device or about a given call |
| | |

The following sections list the services provided for each set of CSTA services in this table.

Application Session Services

- Start Application Session
- Stop Application Session
- Reset Application Session Timer

Physical Device Services

- Button Press
- Get Button Information
- Get Display
- Get Hookswitch Status
- Get Lamp Mode
- Get Message Waiting Indicator
- Get Ringer Status

Voice Unit Services

- Play Message
- Record Message
- Resume
- Stop
- Suspend
- Delete Message

Monitoring Services

- Monitor Start
- Monitor Stop

Call Control Services

- Single Step Conference

Note:

Events for Call Control services are not supported.

Snapshot Services

- Snapshot Device Request
- Snapshot Call Request

Avaya extensions to CSTA III

The Device, Media, and Call Control APIs provide extensions to CSTA that are meant to enhance the capabilities of CSTA and provide higher-level services and useful events that make development of telephony applications easier. The extensions are summarized in this section. More complete descriptions of each extension can be found in the programmer's guides and the programmer's references (Javadoc and XMLdoc).

| Avaya extension | Extends which CSTA service set | Purpose |
|-----------------------------------|--------------------------------|---|
| Device Services | None | Provides an identifier for a given extension on a given switch |
| Service Provider (Java only) | All | Provides a starting point to access all other CSTA and Avaya services |
| Registration Services | None | Provides ability to gain exclusive or shared control over switch endpoints - also referred to as <i>device registration</i> |
| Extended Voice Unit Services | Voice Unit Services | Provides dubbing of recorded messages and other extensions to playing and recording of files |
| Tone Collection Services | None | Detects DTMF tones and buffers them as requested before reporting them to the application |
| Call Information Services | None | Provides the ability to obtain detailed call information and to determine the status of the call information link. |
| Asynchronous Services (Java only) | None | Provides the ability to send requests asynchronously. |

The following sections list the services provided for each type of extension in this table.

Device Services

- Get Device ID
- Get Third Party Device ID

Service Provider (Java only)

- Get Service Provider
- Get Service
- Reconnect
- Disconnect
- Get Session ID
- Get Negotiated API Version
- Add Service Provider Listener
- Remove Service Provider Listener

Registration Services

- Register Terminal
- Unregister Terminal

Media Control Services

- Media Start
- Media Stop

Extended Voice Unit Services

- Start Dubbing
- Stop Dubbing
- Stop Playing
- Stop Recording
- Suspend Playing
- Suspend Recording
- Resume Playing
- Resume Recording

Tone Detection

No Services--only events

Tone Collection Services

- Start Tone Collection
- Tone Collection Criteria
- Stop Tone Collection
- Flush Buffer

Call Information Services

- Get Call Information
- Get Link Status

Services provided by TSAPI/JTAPI

TSAPI and JTAPI provide third party call control services, including Private Data Services, provided by Avaya Communication Manager. Private Data Services allow you to take advantage of the extended functionality of Communication Manager services.

Following are the services and events provided by TSAPI/JTAPI.

Call Control Services

Enable a telephony client application to control a call or connection on Communication Manager. Typical uses of these services are placing calls from a device and controlling a connection for a single call.

- Alternate Call
- Answer Call
- Clear Call
- Clear Connection
- Conference Call
- Consultation Call
- Consultation-Direct-Agent Call
- Consultation Supervisor-Assist Call
- Deflect Call
- Hold Call

- Make Call
- Make Direct-Agent Call
- Make Predictive Call
- Make Supervisor-Assist Call
- Pickup Call
- Reconnect Call
- Retrieve Call
- Selective Listening Hold
- Selective Listening Retrieve
- Send DTMF Tone
- Single Step Conference
- Transfer Call

Set Feature

Allow a client application to set switch-controlled features or values on Communication Manager.

- Set Advice Of Charge
- Set Agent State
- Set Bill Rate
- Set Do Not Disturb
- Set Forwarding
- Set Message Waiting Indicator

Query

Allow a client to query device features and static attributes of a Communication Manager device.

- Query ACD Split
- Query Agent Login
- Query Agent Measurements
- Query Agent State
- Query Call Classifier

Services provided by the APIs

- Query Device Info
- Query Device Name
- Query Do Not Disturb
- Query Forwarding
- Query Message Waiting Indicator
- Query Split/Skill Measurements
- Query Time of Day
- Query Trunk Group
- Query Trunk Group Measurements
- Query Station Status
- Query Universal Call ID
- Query VDN Measurements

Snapshot

Allow a client application to take a snapshot of a call or device on Communication Manager.

- Snapshot Call
- Snapshot Device

Monitor

Allow a client application to request and cancel the reporting of events that cause a change in the state of Communication Manager object.

- Change Monitor Filter
- Monitor Call
- Monitor Calls Via Device
- Monitor Device
- Monitor Ended Event
- Monitor Stop on Call
- Monitor Stop

Event Report

Provide a client application with the reports of events that cause a change in the state of a call, a connection, or a device.

- Call Event Reports
- Call Cleared
- Charge Advice
- Connection Cleared
- Conferenced
- Delivered
- Diverted
- Entered Digits
- Established
- Failed
- Network Reached
- Originated
- Queued
- Retrieved
- Service Initiated
- Transferred
- Agent State Event Reports
- Logged On
- Logged Off

Routing

Allow Communication Manager to request and receive routing instructions for a call from a client application.

- Route End Event
- Route End Service
- Route Register Abort Event
- Route Register Cancel Service

Services provided by the APIs

- Route Register Service
- Route Request Service
- Route Select Service
- Route Used Event

Escape

Allow an application to request a private service that is not defined by the CSTA Standard.

- Escape Service
- Private Event
- Private Status Event

System Status

Allow an application to request system status information from Communication Manager.

- System Status Request
- System Status Start
- System Status Stop
- Change System Status Filter
- System Status Event

Services provided by the CVLAN API

CVLAN is an API based on the ASAI protocol. It consists of the ASAI library, which provide an application with the ability to send and receive ASAI third-party call control messages (in the form of ASAI capabilities) to and from Communication Manager. For more information about the ASAI Call Control capabilities see [Services provided by ASAI \(DLG protocol\)](#) on page 34. ASAI capabilities are the building blocks that developers use for creating and maintaining applications. In the context of CVLAN, ASAI capabilities are treated as Application Service Elements (because CVLAN is a client-server implementation of the ASAI protocol). CVLAN provides the following Application Service Elements:

- Event Notification and Event Reports
- Third Party Call Control Capabilities

- Set Value
- Request Feature
- Adjunct Routing
- Maintenance
- Abort Capabilities

Event Notification and Event Reports

The Event Notification capability group provides capabilities for a client to obtain information related to specific events that are monitored by the AE Services server. For example, an application can monitor the progress of calls arriving at an ACD split. Based on the event information received, the client can take various actions by invoking other ASEs, such as Third Party Take Control. The Event Notification ASE provides capabilities for the following:

- Initiating event notification
 - Event Notification Request
- Terminating event notification
 - Event Notification Cancel
 - Event Notification End
 - Event Notification Stop Call Notification
- Event Reports

The Event Report capability is used by the server to report call-related events. An event applies to one of the following:

- A party on a call
- Multiple parties on a call
- A call independent of parties
- A particular Communication Manager entity (ACD agents) independent of any call

Third Party Call Control Services

Third Party Call Control allows a client to establish, control, terminate, and monitor calls to which the client is not a party. When invoking the Third Party capabilities, the client controls a call on behalf of a party to the call. For example, a client can request that a call be set up between Party A and Party B. At a later time, Party C can be conferenced into the call. The server handles the third party conference request as if it had been made by Party A or Party B.

Services provided by the APIs

Third Party Call Control provides for the following:

- Third Party Answer Call
- Third Party Automatic Dialing
- Third Party Clear Call
- Third Party End Call
- Third Party Domain Control
- Third Party Domain Control End
- Third Party Listen Disconnect
- Third Party Listen Reconnect
- Third Party Make Call
- Third Party Merge
- Third Party Reconnect
- Third Party Redirect Call
- Third Party Relinquish Control
- Third Party Selective Drop
- Third Party Selective Hold
- Third Party Call Control Capabilities
- Third Party Send DTMF Signals
- Third Party Single-Step Conference
- Third Party Take Control

Set Value

Set Value allows a client to request that a server do the following

- Set the Message Waiting Indicator (MWI) or
- Activate the Flexible Billing Feature.

Request Feature

Consists of the Request Feature capability. Request Feature allows the client to request one of the following features:

- Agent login
- Agent logout
- Change Agent Work Mode
- Change Agent Work Mode (Pending)
- Call Forwarding
- Send All Calls

Adjunct Routing

Allows the client to request routing instructions based on the incoming call resources used by the call (such as originating address or destination address). The Adjunct Routing capability group consists of the following capabilities:

- Routing
- Route Select
- Route End

Maintenance

Allows a client to request the Heartbeat capability. Both Communication Manager and the adjunct can issue a Heartbeat request.

The Abort capability is also part of this capability group.

Abort Capabilities

Allows the client to inform the peer entity (client or server) that processing for the ASE is terminating.

The ASAI library includes an Abort capability that is part of every capability group. The Abort capability provides two types of Aborts:

- A client-initiated abort
- A library-initiated abort

Services provided by ASAI (DLG protocol)

The Adjunct Switch Application Interface (ASAI) is the Avaya proprietary protocol for CTI applications that use Communication Manager. Applications that are developed with the ASAI Protocol use the AE Services DLG Service to communicate with Communication Manager.

The ASAI protocol/DLG Service provides the following third-party call control capability groups:

- Call Control
- Domain Control
- Notification
- Adjunct Routing
- Request Feature
- Value Query
- Set Value
- Maintenance

The following sections describe the CTI features that these capability groups provide.

Call Control Services

Allows the adjunct to place a call, monitor a call, and control a call as it moves through Communication Manager. With call control, an adjunct can control any and all parties that are participating in that call. “Control” means that the adjunct can tell Communication Manager what to do with the call (for example, hold, transfer, drop). “Control” also implies that Communication Manager sends call event reports to the adjunct. The following are features available with Call Control:

- Third Party Make Call
- Third Party Take Control
- Third Party Selective Hold
- Third Party Reconnect
- Redirect Call
- Third Party Merge
- Third Party Selective Drop
- Third Party Selective Listening
- Third Party Single-Step Conference

- Third Party Relinquish Control
- Third Party Clear Call
- Third Party Send DTMF Signals
- Third Party Call Ended

Domain Control

Allows the adjunct to place, monitor, and control all calls at a specific telephone. Domain control is similar to Call Control, except that the adjunct can only manipulate calls at a single telephone (the one that is domain-controlled). The following are services available with Domain Control:

- Third Party Domain Control Request
 - for telephone extension
 - for Automatic Call Distributor (ACD) hunt group extension
- Third Party Answer
- Third Party Auto Dial
- Third Party Selective Hold
- Third Party Reconnect
- Redirect Call
- Third Party Merge
- Third Party Selective Drop
- Third Party Relinquish Control
- Third Party Send Dual Tone Multi Frequency (DTMF) Signals
- Third Party Single-Step Conference
- Third Party Domain Control Ended

Notification

Allows the adjunct to request events for certain calls from Communication Manager. Calls entering the domain for which notification was requested — Vector Directory Number (VDN), Automatic Call Distributor (ACD) — cause event reports to be sent to the adjunct. With notification, the adjunct can only observe a call, but can not control it. The following are features available with Notification:

- Event Notification Request
- Event Notification Cancel
- Stop Call Notification
- Event Notification Ended

Adjunct Routing

Allows Communication Manager to request and receive routing instructions for a call. These instructions, issued by the adjunct, are based on information received about the call. A sequence of three messages is included in adjunct routing:

- Route Request
- Route Select
- Route End

Value Query

Allows the adjunct to query for information about Communication Manager resources; for example, number of agents logged in, the trunks being used, the call classifiers being used. Communication Manager provides information based on the request. The following are features available with Value Query:

- Automatic Call Distributor (ACD) Agent Login Query
- ACD Agent Status Query
- ACD Hunt Group Status Query
- Call Classifier Status Query
- Call Information Query
- Date/Time Query
- Extension Type Query

- Integrated Directory Database Query
- Party Identification (ID) Query
- Station Feature Query
 - Call Forwarding
 - Message Waiting Lamp
 - SendAllCalls
- Station Status Query
- Trunk Group Status Query
- UCID (Universal Call ID) Query

Set Value

Allows the adjunct to set specific values in Communication Manager for the following items:

- Message Waiting Lamp
- Billing Rate

Maintenance

Allows Communication Manager and the adjunct to communicate about the status of the end-to-end connection. The following are features available with Maintenance:

- Heartbeat
- Suspend Alarms
- Resume Alarms
- Restart

Chapter 3: Capacities

CTI message rates

There are two CTI message rate capacities:

- System limit
- Board limit (C-LAN board or processor ethernet)

System limits

- For S87xx and S8500x, the system limit is 720 messages per second full duplex (720 mps to Communication Manager, and 720 mps from Communication Manager).
- For S8300, S8400, and S8500c (Processor Ethernet), the system limit is 240 messages per second full duplex (240 mps to Communication Manager, and 240 mps from Communication Manager).
- On AE Services 3.1.x and 4.0, the system limit is 720 messages per second full duplex (720 mps to Communication Manager, and 720 mps from Communication Manager).
- On AE Services 3.0, the system limit is 480 messages per second full duplex (480 mps to Communication Manager, and 480 mps from Communication Manager).

Board limits

The board limit for a TN799 C-LAN board or processor ethernet is 200 messages per second to CM, 240 messages per second from CM.

In order for an AE Services server to support 720 messages per second, it must be provisioned with at least three C-LAN boards.

ASAI association capacity

- The number of supported domain controls on Communication Manager 4.0 is 32,000. This increase applies only to the S87-series servers and the S8500 server. If Communication Manager is used for call center or other call control functionality, care must be taken to not exceed the total number of domain controls.
- The number of supported generic associations on the AE Services Server (AE Server) is 32,768.

Capacities for LCS integration

The AE Services Integration with Microsoft LCS 2005 supports:

- Six TR/67 (CSTA 3) messages per second per 1000 users
- A maximum of 5,000 concurrent application sessions to client applications (MOC) processing 8500 calls per hour
- A Busy Hour Call Completion rate, in terms of Live Communications Server traffic, of 17000 calls per hour

This rate is based on counting a Make Call request and an Answer Call request as separate calls on the AE Server. One Microsoft Office Client user calling another Microsoft Office Client user would therefore count as two calls in the BHCC measurements.

- A Microsoft LCS 2005 SP1 or the traditional API use (DMCC, CVLAN, DLG, and TSAPI) integration, but not both
- A single Microsoft LCS 2005 SP1 or Enterprise pool per server
- Up to 16 Communication Managers (CM)

Other factors influencing AE Services capacities

The number of simultaneous active calls that your application can expect to handle depends on many factors, such as:

- Other applications running on your application machine and the AE Services server
- The processor speed of the application machine and the AE Services server
- The amount of Communication Manager IP traffic and number of IP resources (such as C-LANs) to handle the traffic
- The amount of other IP network traffic
- The combination and timing of service requests your application makes
- The amount of RAM available on your server

Capacities for calls in Device, Media, and Call Control applications

The number of simultaneous active calls that Device, Media, and Call Control applications can expect to handle depends on many factors, besides those listed previously in [Other factors influencing AE Services capacities](#):

- Your application's demand for VoIP resources relative to the VoIP resources available on Communication Manager
- The codec used /packet size for media
- Media mode used
- Whether encryption is used for application link, signaling link, or media

In lab tests, the following results were obtained for our call recording application and station registration application only (no call recording). These results were obtained using a remote client proxy. The following table also shows how the use of the new encryption features can affect performance.

For more information about the new security features, see the *White-paper on Security in Application Enablement Services for Bundled and Software only solutions*.

Table 2: Device, Media, and Call Control Performance Capabilities

| Configuration Offer | Offer Type | Encryption | Codec Type | Capacity on AE Services server | Traffic Rate for applications |
|---------------------------------------|---------------------|--|------------|--------------------------------|---|
| Exclusive Control - Client Media Mode | Bundled and SW-Only | No encryption on any link | Don't Care | 1000 endpoints | 100 simultaneous registrations with 20 simultaneous registrations/C-LAN for a total of 5 C-LANs. A gap of 10 seconds between each set of 100 registrations. |
| Exclusive Control - Client Media Mode | Bundled and SW-Only | Application Link Encryption and H.323 Signaling Link Encryption. Don't Care about Media Encryption | Don't Care | 800 endpoints | 20 simultaneous registrations with 5 simultaneous registrations/C-LAN for a total of 4 C-LANs. A gap of 10 seconds between each set of 20 registrations. |
| Exclusive Control - Telecommuter Mode | Bundled and SW-Only | No encryption on any link | N/A | 1000 endpoints | 100 simultaneous registrations with 20 simultaneous registrations/C-LAN for a total of 5 C-LANs. A gap of 10 seconds between each set of 100 registrations. |
| Exclusive Control - Telecommuter Mode | Bundled and SW-Only | Application Link Encryption and H.323 Signaling Link Encryption. | N/A | 800 endpoints | 20 simultaneous registrations with 5 simultaneous registrations/C-LAN for a total of 4 C-LANs A gap of 10 seconds between each set of 20 registrations. |
| Shared Control Mode | Bundled and SW-Only | No encryption on any link | N/A | 1000 endpoints | 100 simultaneous registrations with 20 simultaneous registrations/C-LAN for a total of 5 C-LANs. A gap of 10 seconds between each set of 20 registrations. |
| Shared Control Mode | Bundled and SW-Only | Application Link Encryption and H.323 Signaling Link Encryption. | N/A | 800 endpoints | 20 simultaneous registrations with 5 simultaneous registrations/C-LAN for a total of 4 C-LANs. A gap of 10 seconds between each set of 20 registrations. |
| Exclusive Control - Server Media Mode | Bundled and SW-Only | No encryption on any link | G.729 | 120 endpoints | 100 simultaneous registrations. A gap of 10 seconds between each set of 100 registrations. |
| 1 of 2 | | | | | |

Table 2: Device, Media, and Call Control Performance Capabilities (continued)

| Configuration Offer | Offer Type | Encryption | Codec Type | Capacity on AE Services server | Traffic Rate for applications |
|---------------------------------------|---------------------|---|------------|---|--|
| Exclusive Control - Server Media Mode | Bundled | Application Link Encryption, H.323 Link Encryption and Media Encryption | G.729 | 96 endpoints | 96 simultaneous registrations |
| Exclusive Control - Server Media Mode | SW-Only | Application Link Encryption, H.323 Link Encryption and Media Encryption | G.729 | 78 endpoints if using 2.4 GHz Machine else 96 endpoints if using 3.0+ GHz Machine | 78 or 96 simultaneous registrations depending on type of machine |
| Exclusive Control - Server Media Mode | Bundled and SW-Only | No encryption on any link | G.711 | 75 endpoints | 75 simultaneous registrations |
| Exclusive Control - Server Media Mode | Bundled | Link Encryption, H.323 Link Encryption and Media Encryption | G.711 | 60 endpoints | 60 simultaneous registrations |
| Exclusive Control - Server Media Mode | SW-Only | Application Link Encryption, H.323 Link Encryption and Media Encryption | G.711 | 50 endpoints if using 2.4 GHz Machine else 60 endpoints if using 3.0+ GHz Machine | 50 or 60 simultaneous registrations depending on type of machine |
| | | | | | 2 of 2 |

Compare the Device, Media, and Call Control capacities listed in this table with the Communication Manager resources and capacities in the next section to make sure that you have adequate Communication Manager resources for a given Device, Media, and Call Control implementation.

Communication Manager capacities for Device, Media, and Call Control

Communication Manager resource capacities

Note:

Using encryption can reduce capacities by 15%.

| Component | Capacity |
|---|---|
| VoIP capacity - For each IP endpoint in the call, including AE Services endpoints, either one VoIP channel will be used (with a G.711 codec) or two VoIP channels will be used (with a G.729 codec) | |
| TN2302 media processor card | 64 channels |
| TN2602 Crossfire media processor card | 320 channels |
| MM760 VoIP card | 64 channels |
| G700 media gateway motherboard VoIP | 64 channels |
| G350 media gateway motherboard VoIP | 32 channels |
| CLAN capacity - CLAN resources handle H.323 signaling traffic | |
| TN799DP CLAN card | 400 Device, Media, and Call Control station registrations |

VoIP capacities on Communication Manager

The VoIP capacity of the Device, Media, and Call Control Service is based on the VoIP capacities of the following Communication Manager components:

- TN2302 media processor card - 64 channels
- TN2602 Crossfire media processor card - 320 channels
- MM760 VoIP card - 64 channels
- G700 media gateway motherboard VoIP - 64 channels
- G350 media gateway motherboard VoIP - 32 channels

For each IP endpoint in the call (including AE Services endpoints), either one VoIP channel will be used (when using a G.711 codec) or two VoIP channels will be used (when using a G.729 codec).

C-LAN capacities on Communication Manager

CLAN resources handle H.323 signaling traffic.

- TN799DP CLAN card - 400 Device, Media, and Call Control station registrations

Capacities for System Management Service

Table 3: System Management Service capacity

| | |
|---|------------------|
| Communication Managers supported | 16 links |
| Simultaneous logins per Communication Manager | 5 |
| Average time of station transaction | 200 messages/sec |

Capacities for CVLAN Service

Table 4: CVLAN Service capacity

| | |
|------------------------|---------------------------|
| Clients supported | 60 |
| ASAI associations | 32k, shared over 16 links |
| Message rate | 720 messages/sec |
| Communication Managers | 16 |

Capacities for DLG Service

Table 5: DLG Service capacity

| | |
|------------------------|------------------|
| Clients supported | 16 |
| Communication Managers | 16 |
| Message rate | 720 messages/sec |

Capacities for TSAPI Service

| | |
|----------------------------|-------------------------------|
| Users (Client connections) | 5000 ¹ |
| Links | 16 |
| Communication Managers | 16 |
| Message rate | 720 messages/sec ² |

1. A client connection refers to a unique IP address connected to AE Services. This number is not related to the number of agents supported.
2. Running at 720 messages/second requires four C-LAN connections. In lab tests we have measured peak capacity at 720 messages/second. If the TSAPI applications running against a single instance of AE Services require sustained rates over 500 messages/second, Avaya recommends adding an additional 1G of RAM to the AE Services server (bringing it to 2G).

Chapter 4: AE Services deployment offers

Avaya provides two AE Services offers:

- Software-only
- Bundled Server

This section explains the main differences between these offers.

Table 6: Hardware/software provided in Software-Only and Bundled Server offers

| Hardware/Software | Included in SW-Only offer? | Included in Bundled Server offer? |
|-----------------------------|----------------------------|-----------------------------------|
| AE Services server software | yes | yes |
| Linux platform | no | yes |
| Third-party software | yes | yes |
| AE Services server machine | no | yes |
| Client application machine | no | no |
| SDKs | yes | yes |

For the **Software-Only Offer**, the customer performs all of the hardware installation and software installation (AE Services software, platform software, third-party software). Avaya provides an installation script for installing the AE Services software and third-party software. Customers also perform all service and maintenance unless they buy an optional Services contract.

These procedures are explained in *Avaya Application Enablement Services Installation Guide Software-Only Offer*.

The Software-Only Offer is provided on a set of two CD-ROMs or can be obtained from the Devconnect site

For the **Bundled Server Offer**, Avaya performs all hardware/software installation and all service and maintenance.

These procedures are explained in *Avaya MultiVantage Application Enablement Services Installation and Upgrade Guide for a Bundled Server*.

The Bundled Server Offer is provided on a DVD or can be obtained from the Devconnect site.

AE Services deployment offers

For **both offers**, the customer must provide a Communication Manager system and network that provide the prerequisites listed in:

- [Communication Manager and media server requirements](#) on page 65
- [Required network characteristics](#) on page 65

Note:

The only Communication Manager administration we provide in the AE Services documents are procedures that are specific to AE Services.

For a list of the required Linux platform and third-party software, see [Software platform](#) on page 62 and [Third-party software](#) on page 63.

When you install AE Services, all of the services that comprise AE Services are installed. However, you are able to use only the services/features that you are licensed to use with AE Services and with Communication Manager. Check with your Avaya representative for licensing information.

Chapter 5: Upgrade considerations

This chapter explains upgrade considerations if you are upgrading from AE Services 3.0/3.1 to AE Services 4.0.

If you are migrating to AE Services from one of the earlier releases of Avaya APIs and services, see [Appendix A: Migration considerations](#).

General AE Services upgrade considerations

- A new AE Services license file is required for all customers installing or upgrading to AE Services 4.0 from AE Services 3.x.
- Customers can run AE Services 3.0/3.1 clients and SDKs with the AE Services 4.0 server. However, configuration changes on the AE Services server may be required.

Correct version of Communication Manager

AE Services 4.0 works only with Communication Manager 3.0 or later.

Upgrading from AE Services 3.0 Device and Media Control

Note:

Device and Media Control is now called Device, Media, and Call Control.

Because of many enhancements to the Device, Media, and Call Control service in 3.1 (and included in AE Services 4.0), compatibility with Device and Media Control 3.0 depends on several considerations, including:

- In AE Services 3.1/4.0, by default the secure port is enabled. We encourage you to use the secure port so that credentials being sent across will not be text.

If, for some reason, you do not want to use the secure port, you will need to enable the non-secure port. For information about doing this, see the *Application Enablement Services Administration and Maintenance Guide*.

Upgrade considerations

- Users must use valid user names and passwords that have been added using the User Management Web pages. For information about doing this, see the *Application Enablement Services Administration and Maintenance Guide*.

The following tables explain the backward compatibility between Device, Media, and Call Control 3.1/4.0 and Device and Media Control 3.0.

Table 7: Backward compatibility using Java SDK

| Application protocol version | Client library protocol version | JDK version | AES server version | Compatible? | Notes |
|------------------------------|---------------------------------|-------------|--------------------|-------------|--|
| 3.0 | 3.0 | 1.4 | 3.1 or 4.0 | yes | New AES 3.1/4.0 features not supported |
| 3.0 | 3.1 | 1.5 | 3.1 or 4.0 | yes | App will need to change to take advantage of new 3.1/4.0 features by using the new Java 3.1. |
| 3.1 | 3.1 | 1.5 | 4.0 | yes | New AES 4.0 features not supported |
| 3.1 | 4.0 | 1.5 | 4.0 | yes | |

Table 8: Backward compatibility using XML protocol

| Application protocol version | AES server version | Compatible? | Notes |
|------------------------------|--------------------|-------------|---|
| 3.0 | 3.1 or 4.0 | yes | Applications will work if using the default nonsecure port. Applications will require modification if using the secure port or other new features. |
| 3.1 | 4.0 | yes | |

Upgrading from AE Services 3.0 CVLAN, TSAPI, JTAPI, and DLG

The JTAPI client was changed for AE Services 3.1. Any applications created with anything other than the 3.1 JTAPI client that try to use the new 3.1 JTAPI client will not work. JTAPI applications that want to use the 3.1 JTAPI client will have to be specifically built against the 3.1 JTAPI client. However, old applications will work if the 3.0 JTAPI client is used with the 3.1 AE Services server.

Upgrade considerations

Chapter 6: Architecture and configurations

This section explains:

- The software architecture, including the interfaces between the AE Services server and Communication Manager and between the AE Services server and the client application
- The possible hardware/software configurations, including guidelines for configurations
- Transport Service

Software architecture

Interface from AE Services server to Communication Manager

- For Device, Media, and Call Control, the AE Services server communicates with Communication Manager over the LAN using an H.323-based protocol for signalling (device) and the Real-Time Protocol (RTP) for media.

When Communication Manager is on an S8300/S8400/S8500 media server, the AE Services server communicates with the processor C-LAN interface (PROCR) and the Voice Over IP (VoIP) media module or other motherboard VoIP. (The VoIP media module for G700 is MM760.) For all other supported Avaya media servers, the AE Services server connects to the C-LAN module and the media processor interface (MEDPRO).

- CallInformationServices sends DAPI messages over the Avaya Enablement Protocol (AEP), a secure transport.
- SMS uses OSSI to communicate with the switch.
- DLG, CVLAN, TSAPI, and Telephony Web Service all communicate with the switch via ASAI/Q.931 over the Avaya Enablement Protocol (AEP), a secure transport.

Interface from AE Services server to client application

A client application runs on a separate machine, the client application machine.

- For Device, Media, and Call Control, the AE Services server communicates with the client application using the XML messages over a TCP connection as specified in *ECMA-323*, Annex G “CSTA XML over TCP” and *ECMA-354*. Both CSTA and Avaya XML messages are used.
- JTAPI/TSAPI use CSTA1/ASN.1.
- CVLAN uses a proprietary protocol.
- DLG uses ASAI messages.

Hardware/software configurations

Configuration guidelines

Application Enablement Services configurations must follow these guidelines:

- Only one instance of the AE Services server software can reside on a AE Services server machine.
- More than one AE Services server machine can connect to an instance of Communication Manager:
 - If a transport link is being used (including Device, Media, and Call Control with Call Information Services)
 - For Linux-based media servers (S8300, S8500, S8710, HP380), up to 16 AE Services servers can connect to an instance of Communication Manager.
For non-Linux-based media servers (Csi), one or two AE Services servers can connect to an instance of Communication Manager.
 - If a transport link is not being used, there is no limit to the number of connections to an instance of Communication Manager.

- The number of AE Services servers that can connect to one instance of Communication Manager is determined by the number of AEP connections that each AE Services server uses. Since the maximum number of AEP connections that one instance of Communication Manager can support is 16, any of the following combinations are possible:
 - 16 AE Services servers, with one AEP connection each
 - Four AE Services servers, with two AEP connections each
 - Four AE Services servers, with four AEP connections each
 or any other combination that totals up to 16 AEP connections
- Applications must run on a separate client application machine (several applications can run on one machine if the machine has the resources to run these applications).
- An application can drive several AE Services servers.
This configuration might be needed if the application requires more call capacity than the AE Services server can provide.
- An AE Services server can switch between an S8700/S8710's active and standby servers, but it cannot *automatically* switch to an S8300 Local Survivable Processor (LSP). In order to do this, certain steps must be performed. These steps are explained in the *White paper on AE Services 3.0 Support for Communication Manager Enterprise Survivable Server (ESS) and Local Survivable Processor (LSP)*. This document is available on the Avaya support site along with the AE Services customer documentation.
- AE Services supports Communication Manager Enterprise Survivable Server (ESS) for many network configurations. For configuration guidelines for supporting ESS, see the *White paper on AE Services 3.0 Support for Communication Manager Enterprise Survivable Server (ESS) and Local Survivable Processor (LSP)*. This document is available on the Avaya support site along with the AE Services customer documentation.

Note:

The Device, Media, and Call Control Java SDK library cannot automatically switch over to a redundant AE Services server.

- All administration is per server, and there is no distribution between servers.

Transport Service

AE Services provides a transport link that establishes and maintains a secure communication channel between AE Services and Communication Manager. This Transport Service, implemented on the AE Services server and on Communication Manager, tunnels ASAI and DAPI messages over TCP/IP, using a proprietary Avaya protocol called Application Enablement Protocol (AEP). The transport link is secured via Transport Layer Security (TLS).

An AEP transport connection is a secure TCP/IP connection between the AE Services server and a C-LAN connection on Communication Manager. When the Transport Service starts up, it establishes the Communication Manager/AEP transport connection sessions based on the switch connections administered in the AE Services OAM.

As of AE Services 3.1, the Link Bounce Resiliency feature provides increased link reliability to the AEP transport connection. This feature ensures that no messages are lost during an interchange or a short network outage of up to 30 seconds.

One AE Services server can support up to 16 AEP transport connections. The 16 transport links provide a redundancy failover capability. If a C-LAN goes down or is not accessible over the network, the traffic is redistributed to the remaining C-LANs. This failure should be transparent to the application, provided that the failed C-LAN was not required to support the message bandwidth required by the application.

Call Control services (TSAPI/JTAPI/CVLAN/DLG) and Device, Media, and Call Control Call Information Service communicate with Communication Manager through the Transport Service.

Support for an Enterprise Survivable Server configuration (AE Services 3.1 and later)

Uninterrupted telephony is important for many enterprises, especially for mission-critical applications. Avaya Communication Manager (CM) provides Enterprise Survivable Server (ESS) and Local Survivable Processor (LSP) for failover from the main media server. This feature provides the ability for media gateways, endpoints, application servers like AE Services and its applications to continue their operations without major interruption.

We recommend that all applications in an ESS configuration connect to a local AE Services server which, in turn, is connected to either the media server at the main site or a media gateway with an ESS or LSP at the remote site. In this configuration, the applications and associated AE Services server at the remote sites are always active and are supplying functionality for the local resources at the remote site. This type of configuration ensures the most seamless survivability in an ESS configuration.

For more in-depth information, see the *White paper on AE Services 3.1 Support for Communication Manager Enterprise Survivable Server (ESS) and Local Survivable Processor (LSP)*. This white paper is available on the Avaya support site along with the customer documents.

Chapter 7: AE Service licensing

AE Services uses Remote Feature Activation (RFA) to generate or update a license file. WebLM is used to enforce the RFA License on the AE Services server.

In addition, many of the services in AE Services require additional features to be licensed on Communication Manager. The following table shows the licensing requirements for the various AE Services. The table shows the Communication Manager licensing as well as the AE Services licensing:

Table 9: Licensing requirements for AE Services

| AE Service | Features licensed on Communication Manager (required) | Features licensed on Communication Manager (optional) | Features enabled on AE Services license |
|--|---|--|--|
| DLG | ASAI Core | <ul style="list-style-type: none"> ● ASAI Plus ● CTI Stations ● Phantom Calls ● Increase Adjunct Routes | DLG enabled |
| CVLAN Non-Avaya applications | ASAI Core | <ul style="list-style-type: none"> ● ASAI Plus ● CTI Stations ● Phantom Calls ● Increased Adjunct Routes | CVLAN enabled |
| CVLAN Avaya applications | Computer Telephony Adjunct Link | <ul style="list-style-type: none"> ● Increased Adjunct Routes | CVLAN enabled Proprietary links: 0 - 16 |
| TSAPI/JTAPI | Computer Telephony Adjunct Link | <ul style="list-style-type: none"> ● Increased Adjunct Routes | <ul style="list-style-type: none"> ● TSAPI Basic Users ● TSAPI Advanced Users (optional) <ul style="list-style-type: none"> - Small(x): csi, 8300, 8400 - Medium(y): 8500 - Large(x): 87xx |
| Device, Media, and Call Control using: -- Device and media control functionality ¹ | IP_API_A ports (license) An IP_API_A license is required for each registered device. | none | None (Certificates distributed in license for application link encryption) |
| 1 of 2 | | | |

Table 9: Licensing requirements for AE Services (continued)

| AE Service | Features licensed on Communication Manager (required) | Features licensed on Communication Manager (optional) | Features enabled on AE Services license |
|--|---|---|---|
| Device, Media, and Call Control using Call Control or Snapshot Services ² | none | none | TSAPI Basic User one Switch Connection |
| Device, Media, and Call Control using Call Information, Services | none | none | one Switch Connection |
| Telephony Web Service | none | none | TSAPI Basic Users |
| System Management | none | none | none |
| Users | none | none | none |
| Switch connections | none | none | 2-16 ³ |
| 2 of 2 | | | |

1. Port/Station (STA) and IP Station (IP_STA) licenses are required on Communication Manager before you can administer a Device, Media, and Call Control device on Communication Manager. Adding a Device, Media, and Call Control station consumes a Port/Station (STA) license and an IP Station (IP_STA) license.

2. See note 1.

3. AE Services provides two C-LAN connections to Communication Manager by default, and incremental C-LAN connections (up to 16) can be purchased.

Licensing for integration with Microsoft LCS 2005

A new license, the Unified Desktop license, supports the AE Services-LCS integration. Like the other licenses, this license is controlled through the AE Services RFA license file. Every active MOC client consumes one Unified Desktop license for the duration of the period that it has an active dialog with AE Services (every registered MOC, not only those in the call). Simultaneous connection RTU are still required. Two simultaneous connections are provided by default.

Note:

The LCS integration does not require a Device, Media, and Call Control IP_API_A license or a TSAPI Basic User license.

Chapter 8: Security considerations and guidelines

For a complete discussion of the security considerations and guidelines for AE Services, see the *White-paper on Security in Application Enablement Services for Bundled and Software only solutions*. This white paper is available on the Avaya support site along with the customer documents.

Chapter 9: Audience and prerequisites

AE Services server hardware requirements

Hardware platform for Software-Only offer

The customer provides the hardware platform for the Software-Only offer

AE Services requires a 3.0-GHz single-processor Pentium IV class machine with:

- 1GB RAM (required)
- 10 GB free disk space (after installing Linux)
- Hard disk drive with at least 7200 rpm rating
- 512 KB L2 cache
- 100 BaseT Ethernet NIC (should be set to full duplex)

Avaya strongly recommends two NICs.

- DVD/CD-ROM drive

Note:

While AE Services 4.0 does support Symmetrical Multiprocessing, it should be noted that AE Services is a network-centric application platform as opposed to a processor-intensive application platform. Adding more processors would not necessarily increase the capacity or performance of the platform.

Note:

The hostname of the AE Services server must be 15 characters or less. To determine the hostname associated with an AE Services server, run the following Linux command from the command line: `uname -n`.

Hardware platform for Bundled Server offer

Avaya provides the hardware platform for the Bundled Server offer

The provided hardware platform includes:

- An IBM X306 box that includes:
 - 3.0 GHz processor
 - 800-MHz front-side bus
 - 1 GB memory
 - 80 GB hard disk drive
 - DVD/CD read-only drive
 - 2 10/100/1000BaseT Ethernet Controllers (on-board NICs)
- A USB modem

Platform and third-party software required for AE Services server

Software platform

Red Hat Enterprise Linux ES 4.0 update 3

Note:

Check the latest AE Services release notes for the latest update supported.

Note:

The AE Services server is supported only on the English version of the Red Hat Linux OS. AE Services is not localized to other languages at this time.

Third-party software

The AE Services installer installs and configures all of the required third-party packages. We *strongly* recommend that you accept this option when installing the server software.

Table 10: Required third-party software

| Name/Minimum Version Supported by AE Services | Required by |
|---|--|
| ActiveMQ 3.0 | System Configuration |
| Apache Http Server 2.0.52-22 | SMS |
| Apache mod_ssl 2.0.52-22 | SMS |
| Apr(apr-util) 0.9.4 | Httpd |
| Axis 1.2 | User Service, Telephony Service |
| Curl 7.12.1-8 | Installer |
| Dialog 1.0 | Installer |
| distcache 1.4.5-6 | Httpd |
| Ethereal 0.10.6-3 | Avaya Services if you have a Services contract |
| gdb 6.3.0.0.0 | Serviceability |
| J2SDK 1.5.2_02 | Device, Media, and Call Control, OAM |
| Kerberos (krb5) 1.3.4-27 krb5-devel, krb5-libs, krb5-workstation | TSAPI |
| Kerberos (pam_krb5) 2.1.8-1 | TSAPI |
| libpcap 1.10-20 | Ethereal |
| libxml2 2.6.16-6 | SMS |
| Mon 0.99.2.6 | Alarming services |
| net-snmp 5.1.2 | Alarming services |
| net-snmp-libs 5.1.2 | Alarming services |
| OpenLDAP 2.2.13-4 | User Service |
| OpenLDAP clients 2.2.13-4 | User Service |
| 1 of 2 | |

Table 10: Required third-party software (continued)

| Name/Minimum Version Supported by AE Services | Required by |
|--|---|
| OpenLDAP servers 2.2.13-4 | User Service |
| Openssl 0.9.7a-43.8 | SMS, Transport Layer |
| pdksh 5.2.14-30.3 | DLG, Call Control |
| PHP 4.3.9-3.9 | SMS |
| PHP Pear 4.3.9-3.1 | SMS |
| PostgreSQL 8.1.3 | TSAPI Service, CVLAN, CMAPI, OAM |
| PostgreSQL-libs 8.1.3 | TSAPI Service, CVLAN, CMAPI, OAM |
| PostgreSQL-server 8.1.3 | TSAPI Service, CVLAN, CMAPI, OAM |
| Tomcat 5.5.9 or later | WebLM, OAM, User Service, Telephony Web Service |
| xerces-c 2.6.0-3 | TSAPI |
| 2 of 2 | |

You are responsible for your license agreements with companies of the third-party software.

Client application machine requirements

You must provide a client application machine for your AE Services system.

Device, Media, and Call Control applications can be developed and executed on any machine that is capable of running the Java 2 Platform, Standard Edition (J2SE) 1.5.

For the other AE Services clients, refer to the *Application Enablement Services 4.0 TSAPI, JTAPI, and CVLAN Client and SDK Installation Guide*.

Communication Manager and media server requirements

AE Services is compatible with all existing Communication Manager R3.x and R4.0.

AE Services supports all media servers and gateways that support Communication Manager 4.0.

Required network characteristics

Network interface configurations

With one exception, Avaya Services recommends that you configure AE Services to use dual NICs (eth0 and eth1).

- **Single NIC**

The application machine, AE Services server, and Communication Manager server reside on a private LAN, virtual LAN (VLAN), or WAN.

Note:

The single NIC configuration is recommended for most S8300, S8400, and S8500c servers that use a Processor Ethernet interface because the IP interface for these servers must be publicly accessible for registration of IP endpoints.

- **Dual NIC (recommended)**

In a dual NIC configuration, one interface is for the communication channel between the AE Services server and the application, and the second interface is for the communication channel between the AE Services server and the Communication Manager C-LAN or processor C-LAN.

- The application and the AE Server are on a LAN (production LAN or VLAN) or WAN.
- The AE Services server and the Communication Manager C-LAN interfaces are on a private LAN or VLAN.

Note:

The communication channel between the AE Services server and Communication Manager (C-LANs) requires a hub or data switch. A crossover cable is not supported.

Supported network configurations

Regardless of whether a LAN, VLAN or WAN is used, The TCP/IP links between the AE Services server and Avaya Communication Manager can be connected with the following network latency requirements:

- No more than a 200ms average round trip packet delivery time as measured with ping over every one-hour time period
- Periodic spiked delays of no more than two seconds while maintaining the 200ms average round trip delivery time as measured with ping over every one-hour time period

These requirements are to maintain the AE Services communication channel with Communication Manager (C-LANs) over a LAN/VLAN or WAN.

Network interface speed and duplex settings

AE Services has been tested at 100BaseT full duplex, and these are the required speed and duplex mode settings. The NIC settings should be verified before installing AE Services.

IP Migration Readiness and Optimization analysis

We also recommend that you use the Avaya IP Migration Readiness and Optimization services to help you safely implement IP-based solutions in a stable, optimized infrastructure.

These services include a two-phased, detailed analysis of the entire network to help assess whether you can deploy a converged IP solution such as AE Services without adversely affecting your existing network applications and services.

The first phase of this analysis is the Customer Infrastructure Readiness Survey (CIRS). Certified Avaya engineers conduct a high-level evaluation of the local and wide area network infrastructure to identify any significant network issues that must be resolved prior to deploying the proposed IP solution.

Phase 2 of this analysis, Network Analysis/Network Optimization (NANO) is required when the CIRS indicates that the network will not support the proposed IP solution at the desired performance levels. Starting with the information and data gathered for the CIRS, Avaya engineers perform problem diagnosis to get at the root causes of network issues. They also provide functional requirements and recommendations for a network design that optimizes all of the resources needed to support the IP solution.

Appendix A: Migration considerations

This appendix explains migration considerations if you are migrating to AE Services from one of the legacy CTI or CMAPI platforms that AE Services has replaced.

See [Overview of AE Services](#) in [Chapter 1: What is Application Enablement Services?](#) for a list of these services.

General migration considerations

Since AE Services provides the current versions of all the interfaces it replaces - Communication Manager API, Avaya CT (TSAPI/JTAPI), CVLAN, and DLG - it runs applications written for all of these products. However, there are sometimes changes to make or procedures to follow in order to run earlier applications on the AE Services platform.

This section does not provide migration procedures.

- For specific information about changing code in applications, see the relevant programmer guide.
- For other migration procedures, see the *Avaya MultiVantage Application Enablement Services Administration and Maintenance Guide*.

Correct version of Communication Manager

AE Services supports Communication Manager 3.0 and later.

Migrating from Communication Manager API 2.1

Consider the following when migrating Communication Manager API 2.1 applications to AE Services.

- Device, Media, and Call Control provides the same functionality as Communication Manager API 2.1 except that it has added the following functionality:

- Session management

The session management feature provides a heartbeat mechanism so that the AE Services server and the application both have a way of determining if the other is functional and that there are no network interruptions. In addition, a mechanism is provided to recover an application session if there is a short network interruption.

- Gatekeeper list

The H.323 gatekeeper list feature provides a way for an application to distribute registrations of Device, Media, and Call Control softphones across multiple C-LANs. The application may send a symbolic name representing the switch, and the AE Services server will use a round-robin algorithm to select a C-LAN IP address for that registration from an administered list of H.323 Gatekeepers.

- Added functionality in CallInformationServices

CallInformationServices can now talk to multiple Communication Managers from a single AE Services server.

- AE Services is compatible with existing Communication Manager API 2.1 Java applications only if they are run with the Device, Media, and Call Control 3.0SDK. (No code changes or recompiles are necessary, but new Jar files must be installed on all clients.)

See Avaya MultiVantage Application Enablement Services Device, Media, and Call Control XML Programmer Guide.

- Communication Manager API 2.1 XML applications will not work with AE Services unless you make several changes at the XML level.

See Avaya MultiVantage Application Enablement Services Device, Media, and Call Control XML Programmer Guide.

- The Communication Manager API Service Call Information Service (formerly DAPI link) now requires an AE Services transport link to Communication Manager.
- When upgrading a Communication Manager API 2.1 application, be aware that the server configuration properties have been moved to the OAM pages.
- The property file is no longer included in the SDK. Now, you set the properties through a property object in your application, although a property file will still work.

Migrating from Avaya CT (TSAPI/JTAPI)

Consider the following when migrating Avaya CT applications to AE Services.

- Depending on how you implemented your TSAPI/JTAPI client settings, you may have to change your client configuration files.
- If you previously set up a firewall between TSAPI/JTAPI clients and the Avaya CT server, you may have to expand the port number assignments on your firewall.

For a list of the recommended ports for your firewall, see the section, “Firewall,” in the *White-paper on Security in Application Enablement Services for Bundled and Software only solutions*. This white paper is located with the AE Services customer documents on the Avaya support site.

- You must migrate the Avaya CT Secure Database (SDB) to AE Services.

For more information and for procedures for these migration considerations, see Chapter 4, “Avaya Computer Telephony and CLVAN migration” in the *Application Enablement Services Administration and Maintenance Guide*.

Migrating from Co-resident DLG

Co-resident DLG is not supported for Communication Manager 3.0/3.1/4.0. For AE Services, customers must migrate to using the DLG service in AE Services.

For migration information, see the *Application Enablement Services Administration and Maintenance Guide*.

Appendix B: AE Services WAN requirements

The WAN requirements changed in AE Services 3.1.

This section details the requirements for the customer's network to support CTI links over a WAN/VLAN/LAN. These are links, connected via a WAN/VLAN/LAN, between the AE Services server machine and the C-LAN(s) in a Communication Manager (CM).

- No more than a 200ms average round trip packet delivery time as measured with `ping` over every one-hour time period
- Periodic spiked delays of no more than two seconds while maintaining the 200ms average round trip delivery time as measured with `ping` over every one-hour time period

These requirements are to maintain the CTI link over a WAN/VLAN/LAN. If the implementation is going to issue route requests, then the associated "wait" step must always have a value greater than the largest "periodic spiked delay". With a maximum of 2 seconds allowed (as stated above) your wait step should be greater than 2 seconds. If you can guarantee "periodic spiked delays" less than 2 seconds, then you can reduce the wait step time-out accordingly. If no response to a route select is received by the switch, the call will follow the remaining vector steps in this specific vector. In other words, you will program the vector to deal with this condition.

If you cannot guarantee "periodic spiked delays" of less than two seconds, then it is important to note the following condition:

If you are using AE Services 3.1/4.0 and encounter "periodic spiked delays" greater than two seconds, then messages will either be:

- Stored and retransmitted after recovering from a short network outage
- or
- Dropped during a long network outage

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