Leveraging Amazon Chime Voice Connector for SIP Trunking

March 2019

Notices

Contents

Abstract

This whitepaper outlines the features and benefits of using Amazon Chime Voice Connector. Amazon Chime Voice Connector is a service that carries your voice traffic over the internet and elastically scales to meet your capacity needs. This whitepaper assumes that you are already familiar with Session Initiation Protocol (SIP) trunking and offers guidance and information on Amazon Chime Voice Connector.

Introduction

Amazon Chime Voice Connector is a pay-as-you-go service that enables companies to make and receive secure, inexpensive phone calls over the internet using their on-premises telephone system, such as a private branch exchange (PBX). The service has no upfront fees, elastically scales based on demand, and supports calling both landline and mobile phone numbers in over 100 countries.

Getting started with Amazon Chime Voice Connector is as easy as a few clicks on the AWS Management Console and then employees can place and receive calls on their desk phones in minutes.

Service Description

Amazon Chime Voice Connector uses standards-based Session Initiation Protocol (SIP) and calls are delivered over the internet using Voice over Internet Protocol (VoIP).

Amazon Chime Voice Connector does not require dedicated data circuits and can use a company's existing internet connection or use AWS Direct Connect public virtual interface for the SIP connection to AWS. The configuration of SIP trunks can be performed in minutes using the AWS Management Console or the Amazon Chime API.

Amazon Chime Voice Connector offers cost-effective rates for outbound calls. In addition, calls to Amazon Chime audio conferences, as well as calls to other companies using Amazon Chime Voice Connector, are at no additional cost. With this service, companies can reduce their voice calling costs without having to replace their on-premises phone system.

Service Benefits

The Amazon Chime Voice Connector provides the following benefits.

Low Cost and Reduced TCO

Amazon Chime Voice Connector provides an easy way to move telephony to the cloud without replacing on-premises phone systems. Using the service, you can reduce your voice calling costs by up to 50% by eliminating fixed telephone network costs and simplifying your voice network administration. To estimate the cost of using Amazon Chime Voice Connector, use the Amazon Chime Pricing page.

Amazon Chime Voice Connector allows you to use SIP trunking infrastructure on-demand with voice encryption available at no extra charge. The elastic scaling of the service eliminates the need to overprovision SIP and/or time-division multiplexing (TDM) trunks for peak capacity. You only pay for what you use and can track your telecom spending in your monthly AWS invoice. There is no charge for creating SIP trunks and no subscription or per-user license fees or concurrent conversation fees.

The following table shows a cost comparison of Amazon Chime Voice Connector with other service offerings.

Table 1 — Cost Comparison of Amazon Chime Voice Connector and Other SIP Offerings

Monthly Cost	Offering 1	Offering 2	Offering 3	Amazon
Inbound call/minute	$0.0000	$0.0000	$0.0045	$0.0022
Outbound call/minute	$0.0080	$0.0120	$0.0070	$0.0049
Concurrent call charge per	$0.8180	$1.0907	$0	$0
Number rental	$0.10	$1.00	$1.00	$1.00
350 minutes/month	$1.87	$2.80	$2.16	$1.40
Normalized Pricing/month	$2.78	$4.89	$3.16	$2.40
Potential savings with Amazon Chime Voice Connector	14.67%	68.31%	27.34%	N/A

Flexible and On-Demand

Your telecom administrator uses the AWS Management Console to create the Amazon Chime Voice Connector and your organization can begin sending and receiving voice calls in minutes. You can route as much voice traffic to it as needed or desired, within the AWS service limits.

You can also choose to keep your inbound phone numbers, also known as Direct Inward Dialing (DID) numbers, with your current service provider or contact AWS Support to port the numbers to Amazon Chime Voice Connector and take advantage of the Amazon Chime dial-in rates.

Use Case Scenarios

Amazon Chime Voice Connector can be used to send voice traffic from your on-premises PBX to AWS (voice termination to PSTN numbers), and to receive voice calls from your Voice Connector to your PBX (voice origination from DID numbers).

In both call flow scenarios, voice termination and voice origination, you can connect to Amazon Chime Voice Connector using your existing telephony devices. These devices could be a Session Border Controller (SBC), an IP PBX, or a media gateway.

In the following examples, an SBC is the network element that is used to connect the SIP trunks.

Use Case 1: Outbound Calling Only

In this deployment model, you benefit from the low-cost outbound calling to PSTN phone numbers. Calls from your PBX to Amazon Chime Voice Connector incur no outbound telephony charges. Amazon Chime Voice Connector can be used for outbound calling in conjunction with the existing connection to your current SIP trunking provider. Your inbound calling remains unchanged. In this use case, Amazon Chime Voice Connector is typically configured as a "*route*" for high availability and for least-cost-routing (LCR) within the IP PBX or SBC.

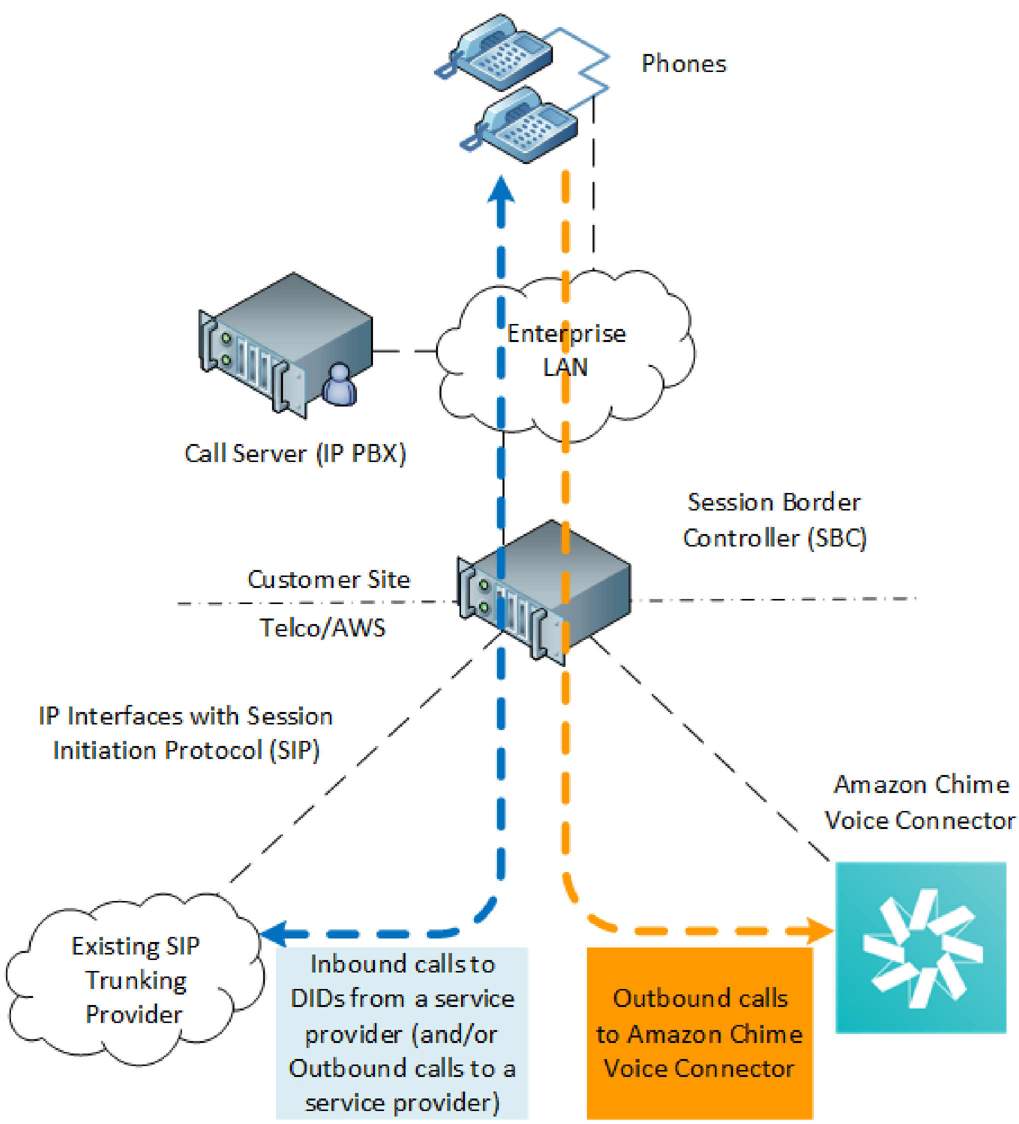

Figure 1 — Outbound Calling Only

Use Case 2: Inbound and Outbound Calling

In this deployment model, you use Amazon Chime Voice Connector for both inbound and outbound voice calling in parallel with your current service provider. For inbound calling, you either acquire new phone numbers from AWS, or port your existing phone numbers from your current service provider. You can move some or all of the phone numbers from your current service provider to Amazon Chime Voice Connector.

For outbound calling, you use Amazon Chime Voice Connector as a parallel route for your outbound voice calls from your PBX.

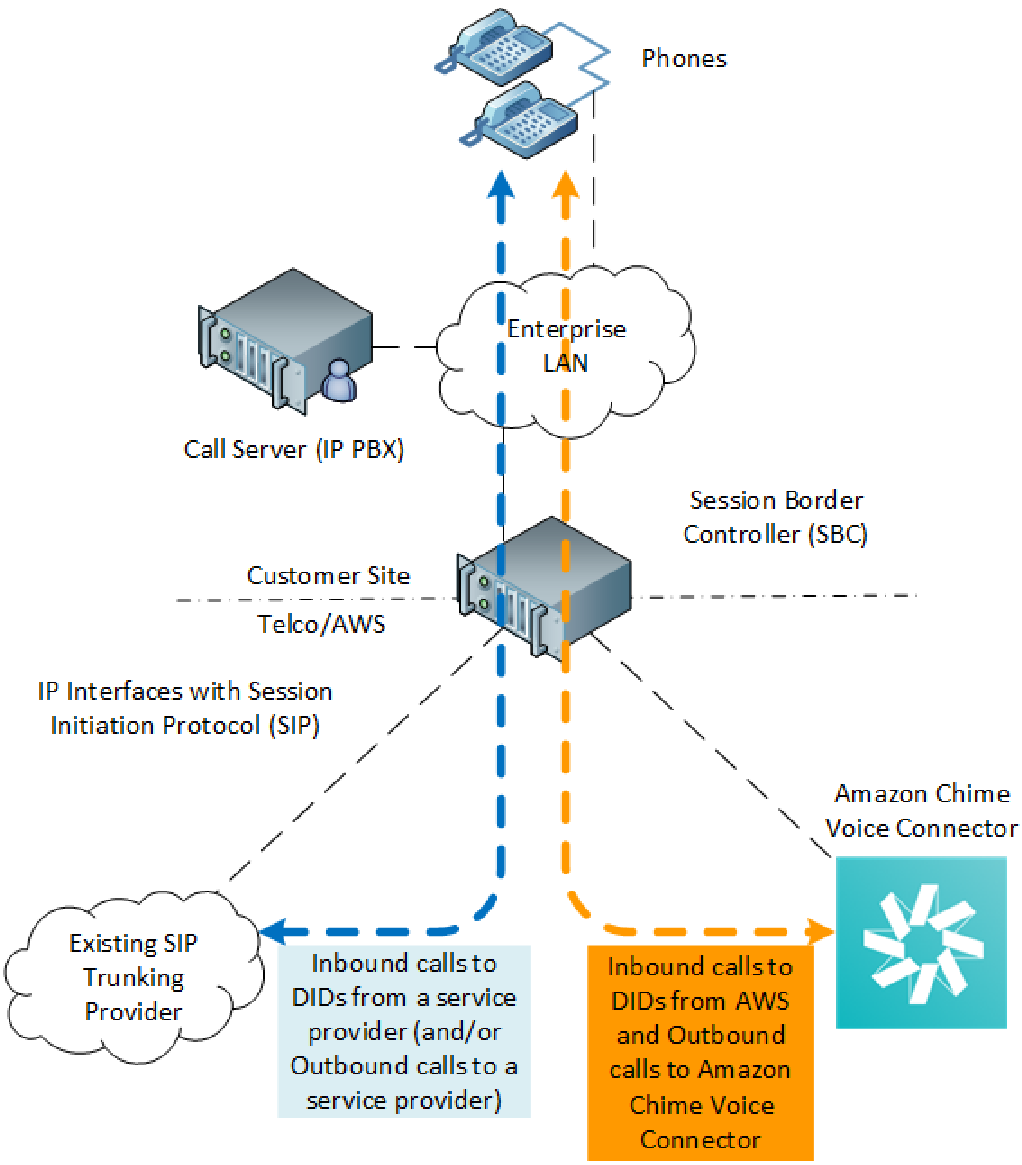

Figure 2 — Inbound and Outbound Calling

Use Case 3: Inbound and Outbound Calling Exclusively

In this deployment model, you use Amazon Chime Voice Connector for both inbound and outbound voice calling. This eliminates the need for your existing SIP trunks and reduces network complexity. For inbound calling, you acquire new phone numbers from AWS, or port the existing phone numbers from your current service provider. For outbound calling, use Amazon Chime Voice Connector as the single route for all outbound voice calls from your PBX. Amazon Chime Voice Connector has built-in call failover, service resilience, and high availability features.

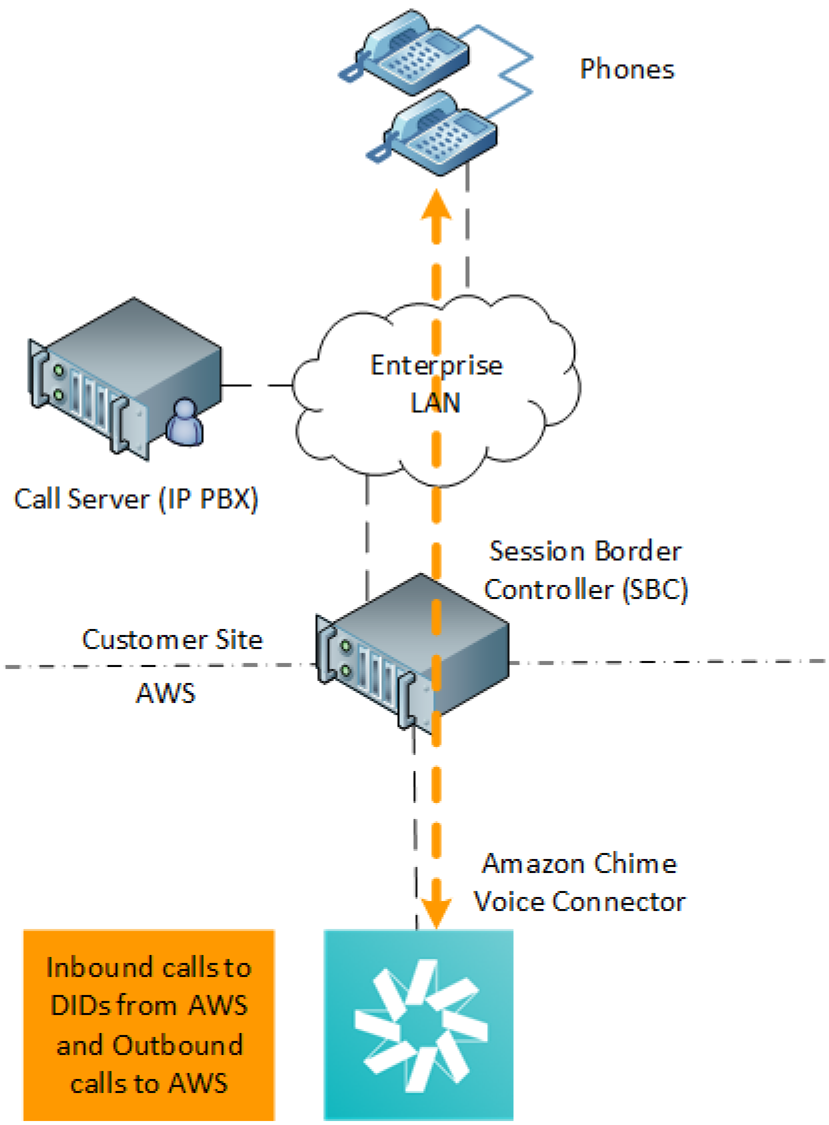

Figure 3 — Inbound and Outbound Calling Exclusively

Use Case 4: Inbound Calling Only

In this deployment model, you use Amazon Chime Voice Connector only for inbound voice calling. For inbound calling only, you acquire new phone numbers from AWS, or port existing phone numbers from your current service provider. For inbound calling only, you benefit from the routing features provided by Amazon Chime Voice Connector, such as load balancing, failure mitigation mechanisms, and easy phone number inventory management, using the AWS Management Console or the [AWS SDK](). For more information on these features, see [Call Routing with Load Sharing]() and [Phone Number Inventory Management]().

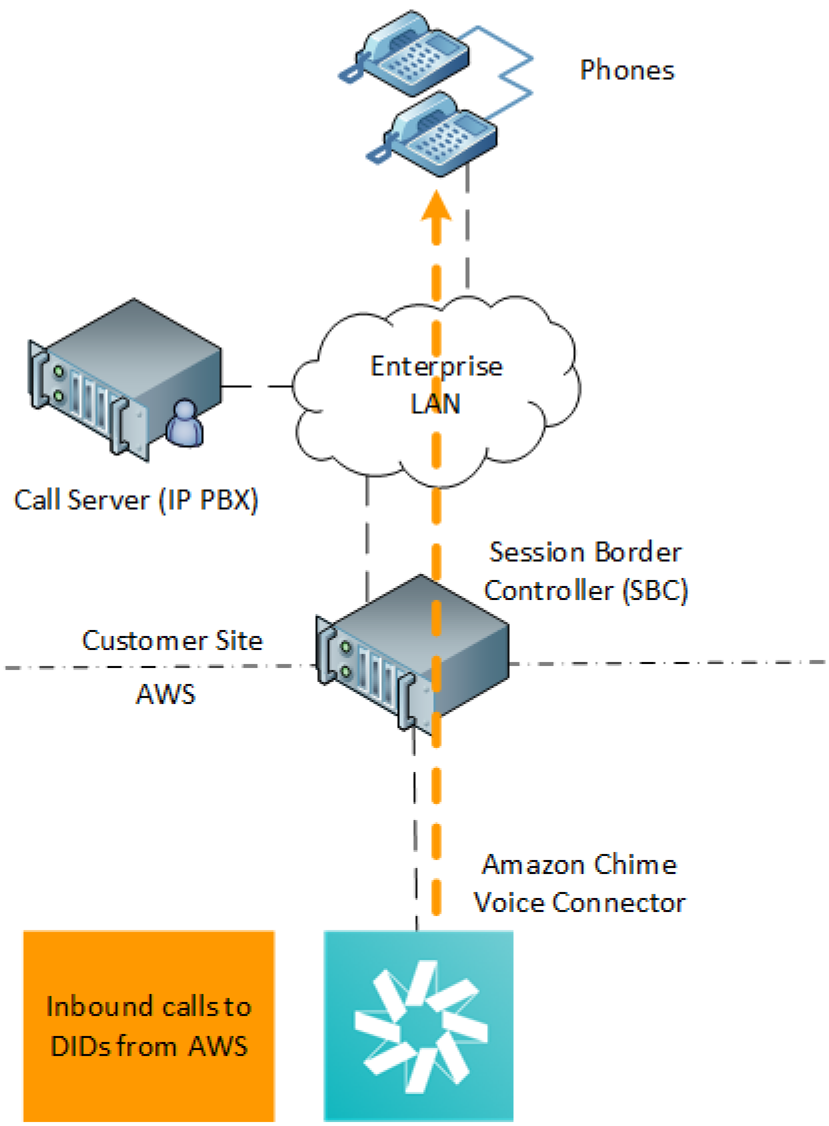

Figure 4 — Inbound Calling Only

Service Features

The Amazon Chime Voice Connector provides the following features.

Reliability, Elasticity, and High Availability

Amazon Chime Voice Connector delivers highly available and scalable telephone service for both inbound and outbound calls. For outbound calls, the service provides call failover and load-sharing mechanisms. Priority and weight call routing are provided for inbound calls.

AWS SDK

The AWS SDK allows an administrator to perform and automate key administrative tasks, such as managing phone numbers, creating, retrieving details and settings, listing, and updating an Amazon Chime Voice Connector.

Security – Call Encryption

Call encryption is a configurable option for each Amazon Chime Voice Connector and is provided at no additional charge. If encryption is enabled, voice calls are encrypted between the service and your SIP infrastructure. Transport Layer Security (TLS) is used to encrypt the SIP signaling and Secure Real Time Protocol (SRTP) is used to encrypt the media streams. Calls over PSTN are not encrypted. To learn about the SIP Signaling Specifications, see Appendix 2: SIP Signaling Specifications.

Call Authentication

Voice traffic can be authenticated by using the mandatory Allow List (IP whitelisting) and by using the optional Digest Authentication (as described in RFC 3261, section 22).

Call Detail Records (CDR)

Shortly after each call, Amazon Chime Voice Connector stores the Call Detail Record (CDR) as an object in your own Amazon Simple Storage Service (Amazon S3) bucket. You configure the S3 bucket in the AWS Management Console. The CDR records can be retrieved from S3 and imported into a VoIP billing system. To learn about the CDR schema, see Appendix 1: Call Detail Record (CDR) Specifications.

Phone Number Inventory Management

Phone number management is done using the AWS Management Console and the AWS SDK. You can manage your existing phone number inventory, order new numbers, review pending transactions, and manage deleted phone numbers. Contact AWS Support to port existing phone numbers.

Call Routing with Load Sharing

Inbound calls are routed using user-defined priorities and weights to automatically route calls to multiple SIP hosts. This is useful for both load balancing and failure mitigation. If a particular host is unavailable, Amazon Chime Voice Connector will automatically re-route calls to the next SIP host based on priority and weight. This allows administrators to send all or a percentage of the calls to one site and to reroute the calls to another site in a disaster scenario. For outbound calls, the hostname is a fully qualified domain name (FQDN) with dynamically assigned multiple IP addresses for load sharing.

Access

Access to the Amazon Chime Voice Connector can be provided through the internet or by using AWS Direct Connect.

Via the Internet

You can connect to Amazon Chime Voice Connector using the internet. The bandwidth between Amazon Chime Voice Connector and your SIP infrastructure must be sufficient to handle the number of simultaneous calls.

Via AWS Direct Connect

You can connect using AWS Direct Connect public virtual interfaces which, in many cases, can reduce your network costs as it is more cost effective than MPLS. AWS Direct Connect can also increase bandwidth throughput, and provide a more consistent network experience than internet-based connections. When you combine Amazon Chime Voice Connector with AWS Direct Connect, your voice call sessions will use a single provider.

Conclusion and Getting Started

Getting started with Amazon Chime Voice Connector is simple, can be done via the AWS Management Console or AWS SDK, and employees can place and receive calls on their desk phones in minutes. Calls are delivered to Amazon over an internet connection using industry-standard VoIP. With Amazon Chime Voice Connector, there are no upfront fees, commitments, or long-term contracts. You only pay for what you use.

Contributors

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Further Reading

For additional information, see:

- Working with Amazon Chime Voice Connectors
- Amazon Chime - Pricing
- Amazon Chime Conference call me rates
- Amazon Chime Conference call dial-in rates
- Amazon Chime - Configuring Call Detail Records
- Amazon Chime Voice Connector Service Limits
- Amazon Chime API Reference
- Amazon Chime Documentation

Document Revisions

Date	Description
March 2019	First publication

Appendix 1: Call Detail Record (CDR) Specifications

Storage Details

Call Detail Records (CDRs) are stored in your Amazon S3 bucket based on your bucket retention policy. CDR objects are stored using names in the following format:

`Amazon-Chime-Voice-Connector-CDRs/json/`***`vconID`***`/`***`yyyy`***`/`***`mm`***`/`***`dd`***`/`***`HH.MM.SS.mmm-transactionID`***

where:

- ***vconID***– Amazon Chime Voice Connector ID
- ***yyyy/mm/dd***– Year, month, and day that the call started
- ***HH.MM.ss.mmm***– Start time of call
- ***transactionID***– Amazon Chime Voice Connector transaction ID

For example:

`Amazon-Chime-Voice-Connector-CDRs/json/grdcp7r7fjejaautia8rvb/2019/03/01/17.10.00.020_123456789`

CDR Schema

CDR objects are stored with no whitespace or newline characters using the following format:

Value	Description
`{"AwsAccountId":"`***`AWS-account-ID`***`",`	AWS account ID
`"TransactionId":"`***`transaction-ID`***`",`	Amazon Chime Voice Connector transaction ID UUID
`"CallId":”`***`SIP-call-ID`***`",`	Customer facing SIP call ID
`"VoiceConnectorId":"`***`voice-connector-ID`***`",`	Amazon Chime Voice Connector ID UUID
`"FromNumber":"`***`phone-number`***`",`	E.164 origination phone number

Value	Description
`"ToNumber":"`***`phone-number`***`",`	E.164 destination phone number
`"StatusMessage":"`***`message-text`***`",`	Additional reason text for error or "`Normal Call Clearing`" if success.
`"Disposition":"`***`disposition-text`***`",`	Indicates call `Origination` or `Termination`
`"Status":"`***`status-text`***`",`	Call status: `Completed`, `Rejected`, or `Rate_Limited`
`"SipAuthUser":"`***`user-name`***`",`	Optional user name sent in the SIP authentication
`"BillableDuration":`***`call-duration`***`,`	Call duration in 1/10th of a minute increments
`"StartTime":`***`time-value`***`,`	Call start time in ISO 8601 format.
`"EndTime":`***`time-value`***`}`	Call end time in ISO 8601 format.

Sample record:

```
{"AwsAccountId":"111122223333","TransactionId":"879eee6e-eec7-4167-b634-a2519506d142","CallId":"777a6b953100721d372188753f2059a8@203.0.113.9:8080","VoiceConnectorId":"1111112222223333334444","FromNumber":"+15105551212","ToNumber":"+16285551212","StatusMessage":"Normal Call Clearing","Disposition":"Termination","Status":"Completed","SipAuthUser":"5600","BillableDuration":30,"StartTime":1552026458563,"EndTime":1552026488036}
```

Appendix 2: SIP Signaling Specifications

Ports and Protocols

Amazon Chime Voice Connector requires the following ports and protocols.

Service	Host	IP Address	Ports
Signaling	N/A	3.80.16.0/23	UDP/5060
			TCP/5060
			TCP/5061
Media	N/A	3.80.16.0/23	UDP/5000:65000
		52.55.62.128/25	UDP/1024:65535
		52.55.63.0/25	UDP/1024:65535
		34.212.95.128/25	UDP/1024:65535
		34.223.21.0/25	UDP/1024:65535

Supported SIP Methods

`OPTIONS`, `INVITE`, `ACK`, `CANCEL`, `BYE`

Unsupported SIP Methods

`SUBSCRIBE`, `NOTIFY`, `PUBLISH`, `INFO`, `REFER`, `UPDATE`, `PRACK`, `MESSAGE`

Dialed Number Requirements

- **Outbound calls:**

  The dialed number must be valid and presented in E.164 format. If a call is placed from the on-premises PBX to a number that is not valid, the call will be rejected with a SIP 403 Forbidden response.

  The dialed number must be presented in E.164 format as the user portion of the Request URI in the SIP INVITE, for example:

  ```
  INVITE sip:+12125551212@abcdefghijklmnop12345.voiceconnector.chime.aws
  ```

The leading "+" is mandatory.

- **Inbound calls:**

  The called number is presented in E.164 format as the user portion of the Request URI in the SIP INVITE. For example:

  ```
  INVITE sip:+12065551212@abcdefghijklmnop12345.voiceconnector.chime.aws
  ```

Caller ID Number Requirements

- **Outbound Calls:**

  The caller ID number is derived from the user portion of the **P-Asserted-Identity:** header, or the **From:** header, in that order. The caller ID must be a valid E.164 formatted US phone number.

- **Inbound Calls:**

  The caller ID number is presented in E.164 format as the user portion of the **P-Asserted-Identity:** and **From:** headers.

Caller ID Name

Caller ID name is not supported.

Authentication and Authorization

Amazon Chime Voice Connector requires IP-based whitelisting for outbound calling. In addition, Digest Authentication is implemented as described in RFC 3261, section 22.

Call Encryption

Enabling encryption in Amazon Chime Voice Connector to use TLS for SIP signaling and Secure RTP (SRTP) for media. Encryption is enabled using the **Secure Trunking** option in the console and the service uses port 5061.

When enabled, all inbound calls use TLS, and unencrypted outbound calls are blocked. You must import the Amazon Chime root certificate. Note that at this time the Amazon Chime Voice Connector service uses a wildcard certificate (`*.voiceconnector.chime.aws`). SRTP is implemented as described in RFC 4568.

For outbound calls, the service uses the SRTP default AWS counter cipher and HMAC-SHA1 message authentication. The following ciphers are supported for inbound and outbound calls:

AES_CM_128_HMAC_SHA1_80
AES_CM_128_HMAC_SHA1_32
AES_CM_192_HMAC_SHA1_80
AES_CM_192_HMAC_SHA1_32
AES_CM_256_HMAC_SHA1_80
AES_CM_256_HMAC_SHA1_32

At least one cipher is mandatory, but all can be included in preference order. There is no additional charge for voice encryption.

Session Description Protocol (SDP)

SDP is implemented as described in RFC 4566.

Supported Codecs

The service supports G.711 µ-law, and G.722 pass-through for Amazon Chime meeting dial-ins only.

DTMF

Dual-tone multifrequency (DTMF) is implemented as described in RFC 4733 (also known as RFC 2833 DTMF).