

Computer Supported Telecommunications Applications (CSTA with AppLink), CS

DESCRIPTION



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GENERAL

Computer Supported Telecommunications Applications (CSTA) is an application protocol that allows the interfacing of a computer domain with a telephony domain. It supports applications or services normally provided by one domain to be available to other domains that normally does not support such application without major enhancement or redesign.

The purpose of this functionality is to support a Computer Telephony Integration (CTI) protocol, for example, ECMA-CSTA, between a telephony domain (MX-ONE Service Node and the protocol converter) and a computing domain (host computer with CTI application).

The rest of this document will refer to the protocol converter as the ApplicationLink.

The main application for this implementation of CSTA is call centers, where agents handling incoming calls can get synchronized screen updates together with the telephone call.

When a call arrives at an agent position, a message is sent from the exchange to the computer, informing of the event. The message will contain call information like:

- Which agent received the call
- Who is calling (A-number)
- What number was dialed (for example, internal group hunting group number)

The computer will typically take this information and do a database search to update the computer screen of the agent with the caller's profile.

Normally, the agent would handle the telephony traffic from the computer terminal, causing CSTA requests to be sent from the computer to the exchange. It is possible for the agents to wear head-sets, and use the computer terminal as a telephone.

Other types of applications could be outbound call centers, like telemarketing or debt collection.

The full CSTA functionality is valid for voice calls and voice handling devices. Call events are **not** sent for instant messaging, SMS and video calls.

The CSTA application in the MX-ONE Service Node functions as a server to support the Application Link clients.

An Application Link is logically connected between the MX-ONE Service Node and the host computer running the CTI application. It is used to convert the Mitel proprietary signaling format to some sort of standard CTI protocol (for example, ECMA CSTA). The CSTA application in the MX-ONE Service Node, together with the Application Link, supports the CTI application via the following functions:

- Generating CSTA events for monitored objects. That is, status of the object or queue status of the object.
- Performing telephony functions that are requested from the CTI application, for example, make calls.

A monitored object can be an analog extension, a CAS extension, a DTS, a DECT phone, an IP extension, an RXN, a virtual extension, or an ACD/CTI group.

Note: Forked extensions cannot be monitored. Parallel Ringing extensions can be monitored, but each individual number has to be monitored separately.

The general configuration is shown in figure 1:

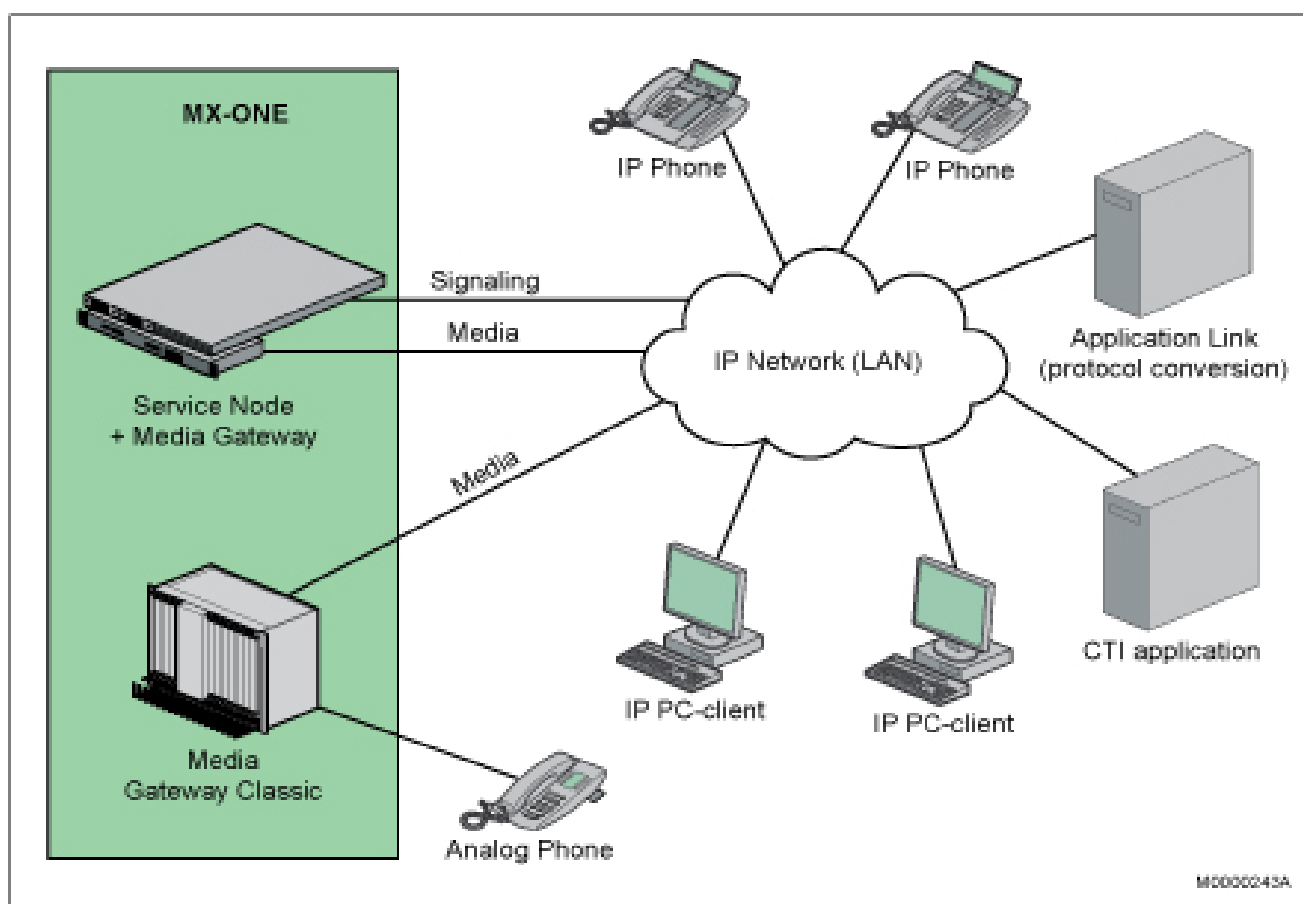


Figure 1: General configuration

2 FACILITIES

2.1 ADMINISTRATION

I/O commands are used to initiate a CSTA port.

2.2 LOAD SHARING AND LINK REDUNDANCY

Up to four client applications are possible to connect to the MX-ONE Service Node.

Each client application can have multiple links, called a link group, to the MX-ONE Service Node. Each link in a link group must be initiated in a different LIM.

The monitored devices will report CSTA events using the most efficient link in the MX-ONE Service Node. If a LIM link goes down for any reason, all CSTA events of this LIM are distributed by the rest of the links that belong to the same Application Link. This is called Load sharing.

If a link can no longer report CSTA events, the events will be reported through another available link in the link group. This link redundancy prevents CSTA events from being lost.

When a link is initiated in the MX-ONE Service Node, the CSTA links are reassigned for the monitored devices for load sharing purposes.

Figure 2 shows the logical connections between the MX-ONE Service Node and four client applications, understanding that physically there is an IP network (LAN). The Application Link 3 and 4 are connected with a single link, which means that a link failure will provoke system isolation. On the other hand, Application Link 2 has a link group with two links, which gives a link redundancy. All devices of LIM 1 monitored by Application Link 2 will share their CSTA events between LIM 2 and LIM 3's CT ports. The whole interconnection is seen in Application Link 1.

If a high call rate exists in a LIM and there are high CSTA traffic, several Ethernet interfaces can be used to avoid congestion (see LIM3 in figure 2).

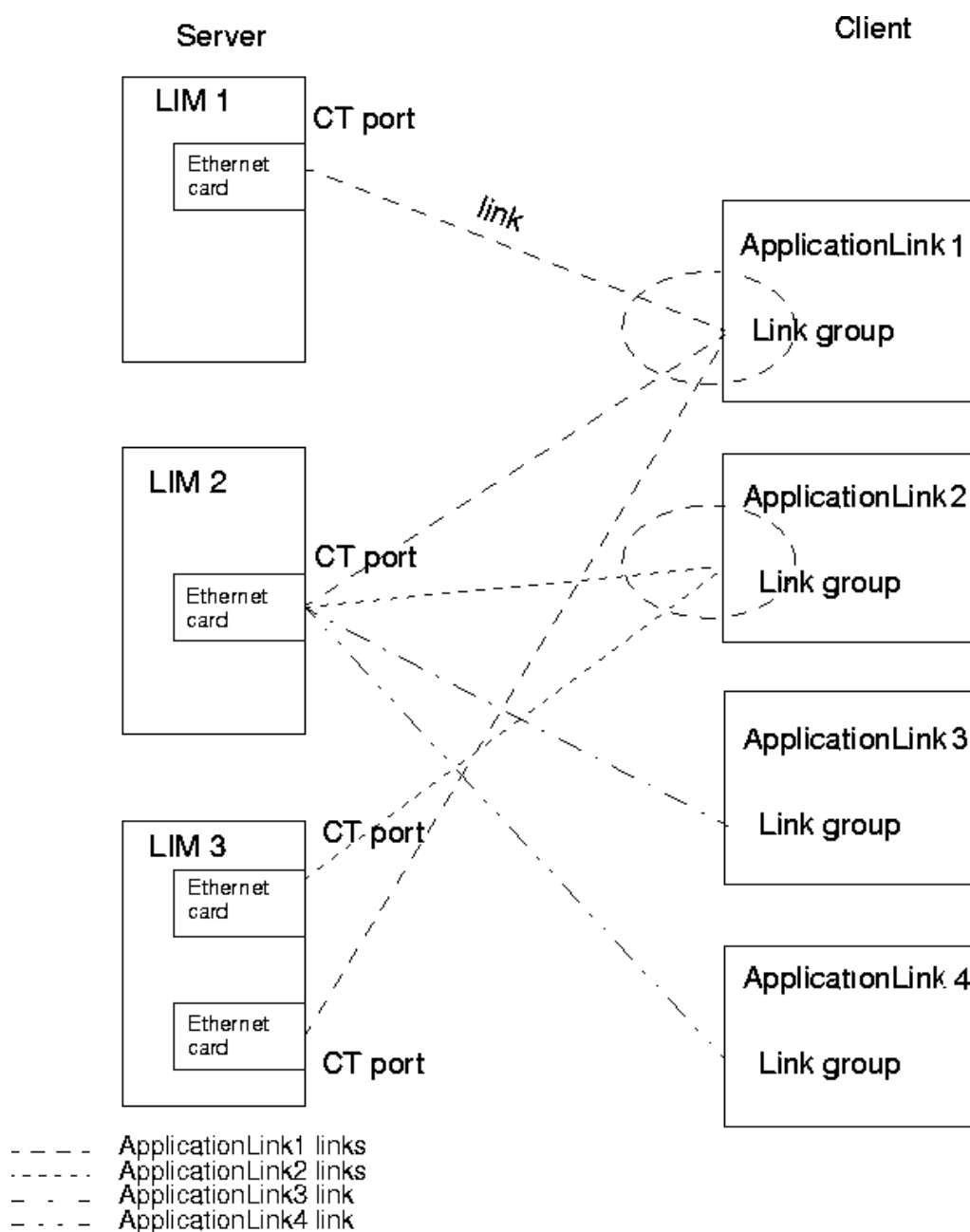


Figure 2: An example of a CTI configuration with load sharing and link redundancy

2.3 STATUS REPORTING SERVICES

2.3.1 VERIFY DIRECTORY NUMBER

The CSTA computer can send a request to the MX-ONE Service Node to verify that a directory number is valid. The MX-ONE Service Node will verify that the given directory number is assigned as an extension, and that the extension is either DTS (ODN or ADN), analog, CAS, CXN (DECT), IPeX, RXN, virtual extension, or the directory number of an ACD group (CTI-group). The response from the MX-ONE Service Node

will also include the LIM number of the extension or the ACD/CTI group and the type of IP extension. If the extension is not an IP extension or is not registered, the type of IP extension is given with a not applicable value.

2.3.2

MONITOR START

The CSTA computer requests the MX-ONE Service Node to start sending event reports for a device by issuing a Monitor Start request. Included in the request is the directory number of the concerned device.

The MX-ONE Service Node will verify that the directory number is an extension number used by an DTS (ODN or ADN), analog, CAS, CXN (DECT), IPeX, RXN, or virtual extension, or as a directory number of an ACD/CTI group. If not, an error message will be returned. In this verification, the type of IP extension, whether it is an MX-ONE IP terminal or not, will be known only for IP extensions.

The MX-ONE Service Node will generate a cross reference ID (CRF_ID) for this monitoring job, and return this to the host in a result signal. If monitoring is already started and a CRF_ID already exists for this directory number, an error message is returned indicating this condition. It is not allowed to have more than one monitoring job per device.

After the monitoring start, event reports will be sent out to the client for the monitored object when a call state or event state changes.

2.3.3

MONITOR STOP

Event reporting will continue until the client issues a Monitor Stop request. The request will include either the CRF_ID for this monitored object or the directory number. The MX-ONE Service Node will verify that the CRF_ID or the directory number is valid. If not, an error message is returned. If valid, the MX-ONE Service Node will stop the event reporting and send a positive response back to the client.

A client can issue a Monitor Reset request to stop all ongoing monitoring jobs that have been started by it.

2.3.4

EVENT REPORTING

The following call state events of a monitored extension will be reported:

- Busy
- Call Waiting (analog, CAS, CXN, RXN, and IPeX (single line))
- Change in Parked Party (analog, CXN, RXN, and CAS extensions only)
- Delivered
- Held
- Idle
- Network Reached
- No Progress
- Parked
- Received
- Reserved (not for IPeX)
- Service Initiated

- Speech

The following device state events of a monitored extension will be reported:

- Blocked
- Free seated

The following feature events will be reported:

- Direct Diversion (not for IPeX, nor CXN or RXN)
- Diversion No Answer (not for IPeX, nor CXN or RXN)
- Diversion On Busy (not for IPeX, nor CXN or RXN)
- Diversion Follow-Me
- Do Not Disturb
- External Follow-Me
- Message Diversion
- Message Waiting
- Personal Number Activation/Change/Deactivation

The following state changes of a monitored ACD/CTI group will be reported:

- Diverted
- Idle
- Queued

The following event will be reported only by a free seating extension:

- Free seating location registration (log on/log off)

The following events will be reported by a host extension:

- Free seated (during log on of a free seating extension)
- Blocked (during log on of a free seating extension and during monitor start when it is already free seated)
- Unblocked (during log off of a free seating extension)

The following Mobility events will be reported for CXN and IPeX:

- Deregistered
- Registered
- Roaming / handover
- Intra-LIM registered

2.3.5

SYSTEM STATUS

2.3.5.1

Manual blocking

If the port to the CSTA application is blocked, the link will be disconnected.

The CSTA application will make an attempt to establish the connection to the MX-ONE Service Node again.

In a LIM where there is no access to any links to a CSTA application, the monitor jobs for this CSTA application are cleared.

2.3.5.2

LIM blocking

The MX-ONE Service Node will report LIM blocking to the host computer using the remaining links.

If the blocked LIM has a link to the CSTA application, the CSTA events for ongoing calls will continue to be reported. No new calls will be allowed in the LIM.

In a LIM where there is no access to any links to a CSTA application, the monitor jobs for this CSTA application are cleared.

Once the blocking condition is cleared, the MX-ONE Service Node will notify the host.

2.3.5.3

LIM isolation

MX-ONE will report LIM isolation to the host computer using the remaining links.

If the isolated LIM has a link to the CSTA application, the CSTA events for ongoing calls and new calls within the LIM, will continue to be reported.

In a LIM where there is no access to any links to a CSTA application, the monitor jobs for this CSTA application are cleared.

Once the isolation condition is cleared, the MX-ONE Service Node will notify the host.

2.3.6

SIP LIMITATIONS COMPARED TO H.323

Supported in SIP extensions:

- Monitoring

Not supported in DBC 42x SIP extensions:

- Proprietary orders/instructions to the phone, for example Make or Answer a call

The Limitations described can also depend on the SIP phone used.

2.4

CALL RELATED SERVICES

2.4.1

ANSWER CALL

This service is used to answer an alerting call on the MX-ONE extension. Included in the request is the access key number of the requesting extension (DTS or IPeX).

2.4.2

CLEAR CALL

This service is used to disconnect an ongoing call (also an incoming call for IPeX) on a monitored extension. Included in the request is the key number. For an IPeX there will be an access key number referred to each one of its calls.

2.4.3

CONFERENCE CALL

This service is used to conference an active call on the extension together with the last parked call. It can also be used to add members to an existing conference (if the extension is the current leader of the conference).

2.4.4 CUSTOMER IDENTITY (CID)

This service is used to enter the CID to tag a call.

2.4.5 DEFLECT

This service is used to move a ringing or active call (deflect) from a monitored extension or ACD queue to a new destination.

Calls in an ACD queue can be deflected to CAS extensions (for example, IVR ports), IP extensions, DECT extensions, and RXN extensions, with maintained queue position, and the extension can be in the same MX-ONE Service Node, or in the public network.

At deflection to a public destination number up to 20 digits are allowed.

2.4.5.1 *Deflect in speech state (Single step transfer)*

This service is used to transfer a call in speech (single step transfer) from a monitored extension to a destination that has to be internal or within the private ISDN/H.323 network or a virtual private network (VPN).

2.4.6 CLEAR QUEUED CALL

This service is used to release a call which is queued in an ACD/CTI group.

2.4.7 REMOVE QUEUE POSITION

This service is used to release the queue position for a deflected call with maintained queue position.

2.4.8 HOLD CALL

This service is used to put an existing call in speech on hold.

The requesting extension must be in speech state. If not, the request will be ignored.

For an analog, a CAS extension, CXN and for RXN, this service will simulate hook-flash on a telephone. It is possible to initiate a new call using the Make call service following the Hold call service.

To put the call on common hold, an analog, a CAS extension, CXN and an RXN must go on-hook after requesting the service.

It is not possible to request the Hold call service while having speech connection with a PBX operator.

2.4.9 MAKE CALL

The Make Call service request is used to set up a call from the extension. Included in the request is the destination number.

Calling party is DTS (ODN or ADN)

A call setup attempt will be made if the line is in register state or idle. If not, the request will be ignored.

Calling party is analog, CAS, or CXN

A call set up will be made if the extension is in register state and the handset is off-hook. If not, the request will be ignored.

Calling party is IPeX

Supported for all types of SIP terminals, but only for proprietary H.323 terminals. A line or line key in idle or register state is required. If the request is not for a supported type of IP terminal, or in the supported states, the request will be ignored.

Calling party is RXN

A call set up will be made towards the RXN.

2.4.10

PRESS FIXED FUNCTION KEY

This service is used to press a fixed function key on the telephone.

Included in the request is the key number of the key to press. MX-ONE Service Node will verify that the key number is in range, and if so, execute the same logic as if the key was pressed manually.

The following keys are available for DTS, analog, CAS extensions, CXN, IPeX, and RXN:

Keypad key (0-9, *, #)

This service is used to dial digits or function codes.

For DTS, analog, CAS, and RXN extensions it can also be used to access suffix services like call-back and intrusion, or to generate end-to-end DTMF tones. The current state of the agent's extension, MDPs and the pressed key will determine the action performed by the MX-ONE Service Node.

For IPeX, the press key service is handled only as an end-to-end DTMF service. The DTMF tones can only be sent if the call is in speech state, otherwise the service request is ignored.

Clear key

This service is used to clear an active call on a DTS.

Transfer key

This service is used to transfer an active call on the DTS to the last parked call on the agent's DTS.

2.4.11

PRESS PROGRAMMABLE KEY

This service is used to simulate the pressing of a programmable key on an MX-ONE IP terminal.

On an IPeX the information programmed on the keys is not known by the MX-ONE Service Node. On the CSTA application side, the services are programmed on specific fictitious programmable keys, which do not necessarily correspond to the real ones on the IPeX. For any standard IPeX, simulating the pressing of these fictitious keys can make the CSTA request Call Back, Intrusion, Call Pick-up, and Call Waiting functions.

For MX-ONE IP terminal, Message Waiting, Manual Message Waiting, and TNS pressing can also be requested. Key numbers referring to access cannot be used to execute services like answer calls, park calls, and retrieve calls. Instead, the existing service functions will be used.

2.4.12

QUERY FEATURE

This service is used to verify the feature status on monitored devices. The response to the request shall indicate:

- Status (activate/inactive) of diversion, individual Do Not Disturb, message diversion, Diversion Follow-Me and External Follow-Me
- Diversion number information
- Key number and status of free on second access line and message waiting
- Key number and status of message waiting
- Active Personal Number Profile.

For IPeX and RXN this Query Feature service will give information about Follow-me, External follow me, message diversion, Do Not Disturb and message waiting.

2.4.13

QUERY MESSAGE DIVERSION TEXT STRINGS

This service is used to obtain message diversion text strings and time and date formats from the MX-ONE Service Node. The response to the request shall indicate the time or date format and the associated text string for each message diversion code (0-9). The query message diversion text string response contains the 20 character text strings for exchange language.

2.4.14

RETRIEVE CALL

This service is used to retrieve a call which was previously on hold while having speech connection with other call.

For analog, CAS, CXN, and RXN extensions, this service is used to simulate hook-flash to alternate speech connection between parties. This service shall not support the retrieval of a common hold call.

2.4.15

SET FEATURE

This service is used to activate or deactivate features on monitored devices. The available features are:

- Message Diversion
- Personal Number Profile Activation/De-Activation

2.4.16

SET FORWARDING

This service is used to activate or deactivate features on monitored devices. The available features are:

- Direct Diversion (not for IPeX, CXN, and RXN)
- Diversion No Answer (not for IPeX, CXN, and RXN)
- Diversion On Busy (not for IPeX, CXN, and RXN)
- Diversion Follow-Me
- External Follow-Me

2.4.17 SET DO NOT DISTURB (DND)

This service is used to activate or deactivate following feature on monitored devices:

- Do Not Disturb

2.4.18 SET MESSAGE WAITING

This service is used to activate or deactivate following feature on monitored/non-monitored devices:

- Message Waiting

2.4.19 TRANSFER CALL

This service is used to connect a held call to the current call in speech and the requesting extension will be released from speech connections.

2.4.20 SERVICES FOR NON-MONITORED EXTENSIONS

- Make call
- Clear call
- Set Message Waiting

These service requests will contain the directory number of the requesting extension. This number will be verified in the same manner as the directory number received in a Monitor Start request.

No CSTA events will be reported for the non-monitored extensions.

2.4.21 SERVICES SUMMARY

Services	DTS	IPeX	RXN	CXN	Analog	CAS	VIE	ACD/CTI groups	Non-monitored devices
Answer call	X	X ¹⁾					X		
Clear call	X	X	X	X	X	X	X		X
Conference call	X	X	X	X	X	X	X		
Customer Identity	X	X	X	X	X	X	X	X	
Deflect call/Single Step Transfer	X	X	X	X	X	X	X	X ²⁾	
Clear Queued Call								X	
Remove Q Position								X	
Hold call	X	X	X	X	X	X	X		
Make call	X	X ¹⁾	X	X	X	X	X		X
Press fixed function key	X	X	X	X	X	X			
Press programmable function key	X	X ³⁾							
Query feature	X	X	X	X	X	X	X		
Retrieve call	X	X	X	X	X	X	X		
Set feature	X	X	X	X	X	X	X		
Set forwarding	X	X	X	X	X	X	X		

Set DND	X	X	X	X	X	X	X		
Set Message Waiting	X	X	X	X	X	X			X
Transfer call	X	X	X	X	X	X	X		

¹⁾ Only for Mitel proprietary IP terminal.

²⁾ Not valid for Single Step Transfer (Deflect in speech state), since speech state is not possible for the group.

³⁾ Some programmed services are only available for Mitel proprietary IP terminal, see chapter 2.4.11 Press programmable key on page 11

VIE means 'virtual SIP extension'. For a virtual extension (i.e. only a generic extension number) services are not supported.

The query message diversion text strings service reports diversion information for the MX-ONE Service Node. The information is not related to a specific type of device.

2.5 OUTBOUND CALL SERVICES

2.5.1 GENERAL

Outbound call center calls can be made by combining a number of services listed in 2.4 Call related services on page 9, and use them for dedicated virtual SIP extensions. Primarily Make Call, Deflect call, Answer call and Clear call, but also other services can be used. Certain services are of course not possible, like Press fix or programmable function key (including DTMF), Set display and Remove queue position.

It is recommended to not allow DID traffic to the virtual SIP extension, and to set services like DND and TCD blocking, to avoid traffic to the dedicated virtual SIP extension (VIE).

2.5.2 ANSWER CALL

This service can be used to answer an alerting call on an MX-ONE extension, here primarily an agent terminal, to which the call has been deflected. Included in the request is the access key number of the requesting extension (only for DTS and multiple access proprietary IPeX).

2.5.3 CLEAR CALL

This service is used to disconnect an ongoing call (also a call from a virtual SIP extension) on a monitored extension. Included in the request is the key number. For a virtual SIP extension there will be one 'dummy' access key number and one ongoing call only.

2.5.4 DEFLECT/SINGLE STEP TRANSFER

This main service in the outbound call context is used to move a call in speech (single step transfer) from a monitored extension or ACD queue to a new destination. Deflect only is supported in ringing state.

2.5.5 MAKE CALL (FOR AN OUTBOUND CALL CENTER CALL)

The Make Call service request is used to set up a call from a virtual SIP extension. Included in the request is the destination number (which is usually a public destination, but can be other numbers too).

Calling party is IPeX

If served/requesting user is an MX-ONE virtual SIP extension (VIE), only one Make Call request is accepted at a time, i.e. only one active call will be allowed. (Other IP extensions may accept more than one active call.)

2.5.6 OTHER SERVICES

The following services can be supported for outbound call center calls, although not directly part of the outbound call functionality.

- Conference call
- Customer Identity (CID) entry
- Hold call
- Query feature
- Retrieve call
- Set DND
- Transfer call

2.6 CAPACITY AND LIMITATIONS

- A maximum of 5 digit devices can be monitored, if devices using 6 or more digits are required, CSTA 3 must be used.
- Maximum 4 ApplicationLink servers (Link Groups) per MX-ONE system.
- A device can only be monitored by one ALserver (Link Group).
- Several applications can monitor the same device via the same ALserver.
- Maximum of 124 CSTA Links per ApplicationLink server (Link Group).
- Maximum 1 CSTA Link per MX-ONE Service Node for a particular Application-Link server (Link Group).
- Maximum 1000 devices can be monitored simultaneously in each MX-ONE Service Node.
- Maximum of 8000 devices can be monitored simultaneously through one ApplicationLink server.
- One ApplicationLink server can be used by several applications to monitor/control a specific user.
- CSTA phase I (AppLink) and CSTA phase III (Xlink) can be used in the same system without restrictions, if they are handling different users. They may not both exercise call control for the same user. They may monitor the same user, but that will cause additional load due to duplicated event reporting.

3 **HARDWARE**

A port has to be available to initiate a CSTA port in the MX-ONE Service Node.

4 **SUMMARY**

CSTA can be used to give agents access to telecommunication features from their computer terminal. This is achieved by connecting the computer network to the telecommunication network via a CSTA interface.

Functions like screen based telephony and screen synchronization are key elements to an efficient call center. They can be implemented with MX-ONE Service Node CSTA.

Outbound call center traffic can be supported.