# Mitel MiContact Center Enterprise

OPEN APPLICATION SERVER
SYSTEM DESCRIPTION

Release 9.5 SP2

◁◁ Mitel®

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# INTRODUCTION

Open Application Server (OAS), an add-on system to MX-ONE, is an open, scalable and distributed platform on which Computer Telephony Integration (CTI) applications can be based. OAS call control model is based on the Computer-Supported Telecommunications Applications (CSTA) protocol model. OAS includes the following features:

- Telephony Services API compliant interface (the Novell NetWare TSAPI) to client applications.

- Extension of TSAPI functions for Media Services and Inter-application Communication Device Services OAS also provides media services, with the following features:

  - Synthesized speech

  - Digitized audio

  - Recognition of spoken input

  - Recognition of DTMF key input

  - Sending DTMF signals

  - Recording of spoken input

  - Network-wide media resource sharing through the Resource Allocation Algorithm described in this document

## WHAT YOU WILL LEARN

In this document, the following will be discussed:

- OAS Architecture

- Multi-tenanting in OAS

- OAS Service Groupings

- OAS Components

- Supported Devices

- Services, Responses, and Events

- OAS Installation

- OAS Support Tools

- OAS Topology Configuration

# OAS ARCHITECTURE

OAS is a distributed system and it contains the following major functional components:

- Client library (DLL)

- Network Resource Manager (NRM)

- Call Control Server

- Media Server(s)

- Basic Services

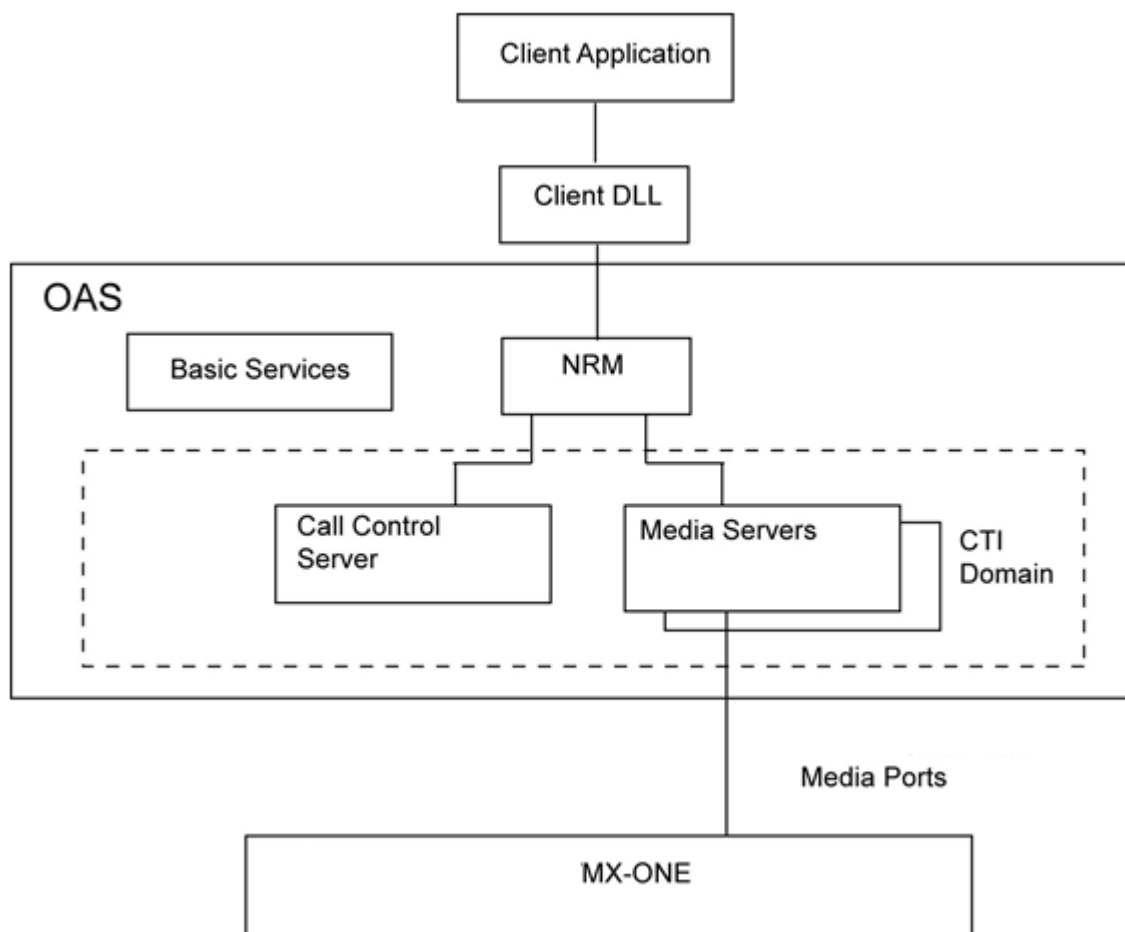See Figure 1  on page 5 for an overview of the primary functional components of OAS.



**Figure 1:  Open Application Server Architecture**

# REQUIREMENTS

OAS and Mitel MiContact Center Enterprise supports up to 20 OAS servers, regardless of the number of MX-ONE sites in a Virtual Contact Center. Due to restrictions in the PBX, there can be a maximum of four OAS on each site if OAS is connected to MX-ONE via ApplicationLink. This limitation does not exist if CSTA III (X-Link) is used.

Each OAS can have up to five media servers per OAS system.

For a complete and updated list of hardware and software requirements please refer to MiCC Enterprise Compability Matrix available in the CPI and on Infochannel.

# MULTI-TENANTING IN OAS

OAS supports an additional feature of multi-tenanting. OAS installation can be chosen to be either non-tenanted or tenanted. In the case of tenanted OAS installation, multiple tenants can be configured for each OAS system. Refer to *OAS Software Configuration* for tenant specific configurations. Each tenant will have the following dedicated functions available:

- CTI group or Basic Virtual Device (BVD) access number.

- Call control and media resources assigned to a tenant. Licenses can be either reserved or shared for each tenant. Refer to the following documents for information on licenses, resource allocation and software configuration; OAS Licensing, Resource Allocation Algorithm and OAS Software Configuration.

- Play Message Lists assigned to a tenant. Refer to the document Play Messages.

- Language libraries assigned to a tenant. Refer to the document Play Messages.

- Security is enabled for each tenant due to which following restrictions apply:

- CTI group assigned to a particular tenant can be monitored only by specifying tenant ID in the TSAPI monitor start request.

- Tenant can only access the media objects contained under its own media container or the system media container.

# OAS SERVICE GROUPINGS

OAS is comprised of a number of services, which are grouped into the following categories:

**Basic Services (BS)**  Basic Services is the basic infrastructure of OAS. The Basic Services components, which are listed below, always reside in the same host.

- Event Channel Service (ECS)

- OAS Configuration Service (OCS)

- Alarm Service

- Performance Data Collector (PDC)

- Trace Service (OTS)

- Start Stop Service (SSS)

**Network Resource Manager (NRM)**

The Network Resource Manager provides a unified interface to the OAS clients, offering call control and media services.

**Call Control Server**

The Call Control Service interfaces with the MX-ONE via either ApplicationLink or X-Link (CSTA III)

**Media Server(s)**

The OAS Media Server connects to MX-ONE via either  H.323 or SIP interfaces and provided media services such as Play, tone recognition. It also interfaces to the Nuance Speech Server for advanced speech recognition and Text To Speech services.

**OAS Administrative Tools**

- OAS Maintenance Tool (OMT)

- OAS Configuration Manager

- Site Data Collection Tool

- Service Tools

**Mitel Daemon**

Mitel Daemon is responsible for continually monitoring the OAS system services running on the host system.

**OAS Client**

The OAS Client DLL component is required in the OAS client host where the client application runs.

# BASIC SERVICES

In this section, the basic services of the OAS are described.

## EVENT CHANNEL SERVICE

Event Channel Service (ECS) sends and receives events from OAS components. That is, ECS handles receiving and sending of events from and to other internal OAS components.

The sender establishes the connection that enables it to send events to ECS over a specific event channel (connection). The receiver registers specific event channel(s) and receives all the events associated to that (those) channel(s).

The following two tasks are performed by ECS:

**1.** Receive events for a specific channel from any number of OAS components

**2.** Send events to OAS components that are registered to receive events

The event channels in table 1 Event Channels on page 11 are the ones that exist in the OAS system:

**Table 1:   Event Channels**

| NAME/DESCRIPTION OF EVENT CHANNEL | EVENT SENDERS | EVENT RECEIVER |
| --- | --- | --- |
| Alarm Event Channel Receives and sends alarm events. | NRM<br><br>Call Control Server<br><br>Media Server<br><br>SSS OCS PDC | Alarm Service |
| Change Notification Event Channel Sends and receives a Change Notification event when OAS configuration data is modified. | OCS | NRM<br><br>Call Control Server<br><br>Media Server<br><br>SSS |
| Log Event Channel Sends and receives OAS trace information. | NRM<br><br>Call Control Server<br><br>Media Server<br><br>PDC | OTS |
| Maintenance Event Channel<br><br>Enables the OAS component to inform its client (another OAS component) about its active existence. | Call Control Server<br><br>Media Server | NRM |
| Performance Event Channel<br><br>Sends and receives run-time data that is used to measure the performance. | NRM | PDC |
| Security Event Channel<br><br>Sends and receives events and alarms. | OCS NRM | Alarm Service |

## OAS CONFIGURATION SERVICE

OAS Configuration Service (OCS) is the configuration service for an OAS system. In addition to storing configuration data in the configuration repository, OCS provides a set of interfaces to add, delete, and modify OAS configuration data.

A client that needs to read or write configuration data must logon to OCS. Upon a successful logon by the client:

**1.**  The communication channel between the client and OCS is established

**2.**  OCS issues access token to the client

OCS protects simultaneous modifications of OAS configuration data. The first client that requests OCS for read- and write access, is granted both accesses. If there is already a client that has got

write access, all other clients that request access are given read-only access. This means, that at any given time, only one OCS client can modify configuration data. Other OCS clients can only view (read) the data.

OCS sends a Configuration Changes Notification Event to ECS to notify all other OAS components about the configuration changes.

## ALARM SERVICE

OAS objects detect abnormal system occurrences and security audit information. An OAS object sends an alarm or security event to ECS over the Alarm Event Channel.

The Alarm Service receives alarms and security events from ECS over the Alarm Event Channel and stores them in the Microsoft Windows 2000 Event Log. Events from OAS components are normally logged into Event Log on the server running OAS Basic Services.

**Note**: If the Alarm Service is out of service, the alarms and security events are stored in the Microsoft Windows Server Event Log on the host of the OAS object reporting the event.

## PERFORMANCE DATA COLLECTOR

OAS components send data required to measure OAS system performance to Event Channel Service (ECS) over the Performance Event Channel. Performance Data Collector (PDC) gets performance data from ECS over the Performance Event Channel, and writes it into the SQL database.

## OAS TRACE SERVICE

OAS Trace Service (OTS) logs trace information into a file. The OAS components, namely Network Resource Manager, Application Link, Media Servers, and Performance Data Collector optionally generate and send run-time trace information to ECS over the Log Event Channel. OTS gets trace information from ECS over the Log Event Channel.

## START STOP SERVICE

Start Stop Service (SSS), an administrative component, manages the following OAS components:

- Alarm Service

- OAS Trace Service

- Performance Data Collector

- Network Resource Manager

- Media Server

- Call Control Server

SSS acts as a server to the OAS Maintenance Tool to route the management requests from users or administrators presented in table 2 Management Requests on page 10.

**Table 2: Management Requests**

| MANAGEMENT REQUEST | DESCRIPTION |
|---|---|
| Start | Make OAS component functionally available. |
| Stop | Make OAS component process exit. |
| Set Trace | Set the file trace ON or OFF as desired. |
| Get Trace | Get the status of file trace (ON or OFF). |
| Execute Maintenance Command | Execute a maintenance action and return the result. |

SSS continuously watches the status of the OAS components that it has started. If any of these components goes out of service abnormally, SSS automatically restarts the components.

# NETWORK RESOURCE MANAGER

Network Resource Manager (NRM) provides a programming interface to OAS client applications to perform call control services and media services. Features of NRM are:

- OAS license administration ￭ for both tenanted and non-tenanted environments.

- Resource Allocation Algorithm ￭ for both tenanted and non-tenanted environments.

- Dynamic and static monitoring support

- Media resource load sharing.

- Tenant security, see chapter Multi-tenanting in OAS on page 6.

## OAS LICENSING ADMINISTRATION

NRM manages all OAS licenses, which are stored in the Enterprise License Manager. NRM reads information about licenses at startup, and dynamically updates the information during run time. Also, NRM enforced licensing policy for each tenant as per the configuration. OAS licenses are categorized in four different types, see table OAS Licenses below for a description.

**Table 3: OAS Licenses**

| LICENSE TYPE | DESCRIPTION |
|---|---|
| Call Control License | Required to monitor physical devices. Note that license is not required to monitor Basic Virtual Device (BVD). |
| Media Port License | Required to allocate Media Port when the client application requests Allocate Resource service. |
| ASR License | Required to allocate Automatic Speech Recognition (ASR) resource when the client application requests NRM for ASR using Allocate Resources service. Each ASR license is composed of two licenses: ASR Grammar and ASR Language. |
| TTS License | Required to allocate Text To Speech (TTS) resource when the client application requests NRM for TTS using Allocate Resources service. |

If NRM does not find a license available for any of the requested resources, NRM sends a Universal Failure event to the client application.

## RESOURCE ALLOCATION ALGORITHM

NRM employs Resource Allocation Algorithm (RAA) to enable client applications to share expensive resource(s). RAA has a built-in load distribution mechanism with respect to media resources. The resource allocation algorithm is also enforced for a particular tenant based on the language library and assigned resources for that tenant.

## DYNAMIC AND STATIC MONITORING

NRM supports two types of monitoring of the physical devices: Dynamic Monitoring and Static Monitoring. You can use OAS Configuration Manager to set the type of monitoring. If Dynamic Monitoring is set, NRM starts monitoring a device only if the following three conditions are true:

1. Client application requests NRM to start monitoring the device

2. Device has been configured with OAS

3. Call Control device license is available

If NRM is set for static monitoring, upon successful start-up NRM begins monitoring as many configured devices as the number of Call Control Device licenses available.

NRM always monitors BVD; the monitoring of BVD is not subject to static or dynamic monitoring.

# CALL CONTROL SERVER

## CALL CONTROL SERVER - APPLICATIONLINK

Call Control Server provides connectivity to the MX-ONE Telephony Server (TSE) by implementing the ECMA CSTA interface to the MX-ONE as defined in the ECMA 180 protocol. This interface provides control services, switching function services, status reporting services, and escape and maintenance services.

> **Note**: The Call Control Server component of OAS cannot be used directly by any client application to perform telephony call control services.

### CALL CONTROL SERVER - MX-ONE CONNECTION CONCEPT

Each logical TCP/IP connection between Call Control Server and the Network Interface Unit (NIU) board in the MX-ONE Telephony switch is called a Computer-Supported Telephony Applications (CSTA) Link. All CSTA Links originating from the same Call Control Server have the same Link Group name, see Figure 2 on page 18  on page 18 (an alpha- numeric string that is not case-sensitive, such as the host name of the Call Control Server).
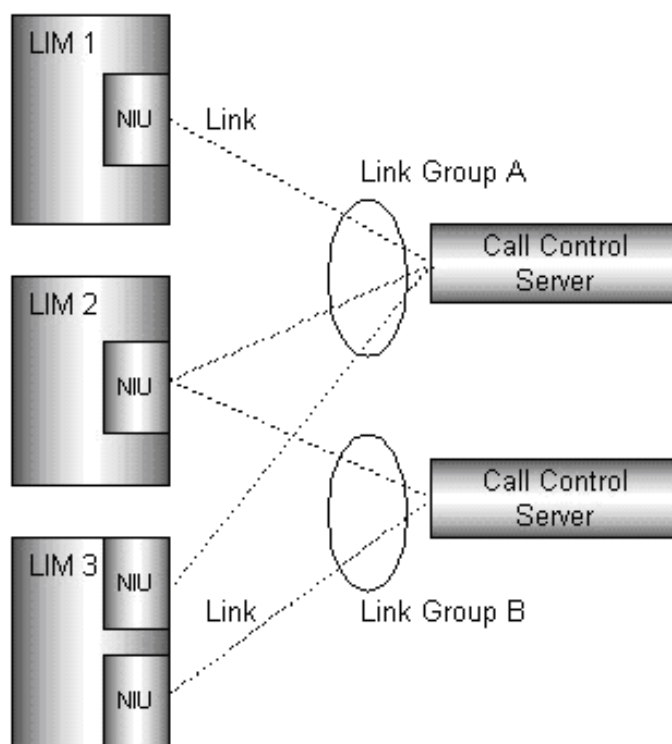


**Figure 2:   MX-ONE Link Group**

## CALL CONTROL SERVER CAPACITIES

A single Call Control Server can only be connected to one MX-ONE node. Although a Call Control Server may use a number of different CSTA links, all the CSTA links must terminate in the same MX-ONE node.

In the case of OAS, only one Call Control Server can be connected to one MX-ONE node, and two Call Control Servers cannot monitor the same device. Only one instance of Call Control Server may be run on a single given server. See table 4 Call Control Server Capacities on page 18 for other Call Control Server capacities.

**Table 4: Call Control Server Capacities**

|  | CAPACITY |
|---|---|
| Call Control Servers (Link Groups) per MX-ONE node | 4 |
| CSTA links per Call Control Server (Link Group) | 124 |
| CSTA links per LIM | 4 |
| CSTA link per LIM for a particular Call Control Server (Link Group) | 1 |
| Devices that can be monitored simultaneously in each LIM | 1000 |
| Devices that can be monitored simultaneously through one Call Control Server | 8000 |

# CALL CONTROL SERVER – X-LINK

The Call Control Server for X-Link is embedded in Network Resource Manager (NRM) and provides connectivity to the MX-ONE Telephony Server (TSE) by implementing the ECMA CSTA phase 3 interface to the MX-ONE as defined in the ECMA 269 protocol.

# MEDIA SERVER

Media servers provide media services using resources existing on the host system. Media servers provide a TSAPI programming interface and are connected with the MX-ONE over VoIP lines. Each media server contains a number of call channels (Media Ports), connected to an MX-ONE through H.323 or SIP lines. Each Media Port within a media server is mapped to a directory number.

## RESOURCE MANAGEMENT

Media Servers use media ports to associate resources with a call. On request from NRM, the media servers allocate and de-allocate required resources to an existing call on a Basic Virtual Device (BVD) or future outbound call from a BVD. Media servers support allocation and de-allocation of the following resources:

- Automatic Speech Recognition (ASR)

- Text To Speech (TTS)

- Sound player

- Recorder

- DTMF signal detector

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- DTMF signal generator

Media servers use IP extensions and provide ASR and TTS services using Nuance software. See table 5 Resource Management for a description of the number of channels supported by each type of media port.

Up to 60 IP Media channels can be used on a server that also hosts other OAS and/or MiCC Enterprise components. On stand-alone media servers up to 100 IP Media channels can be used.

## MEDIA FUNCTIONS

Media servers play prerecorded sound objects, character string, number, date and time along with messages from a text file. Media servers collect Dual Tone Multi-Frequency (DTMF) and Dial Pulse (DP) digits and initiates automatic speech recognition from a call. The media server also transmits DTMF signals on a call and records sound on an established call.

## MEDIA OBJECTS AND CONTAINERS MANAGEMENT

Media Objects are the storage medium in which the following are stored:

1. Coded audio prompts and messages

2. Text Media Objects are stored in Media Containers. The structure of Media Objects and Media Containers is equivalent to files and directories in a file system. Media Server uses the Media Objects to play numbers, dates, time, and so on in the different languages supported by OAS. For each language supported by OAS, the System Media Objects are stored in a container pertaining to that language. Media Server supports media objects encoded in different formats.

   Container security is enforced for each tenant. A tenant can not access the container for another tenant. However, the default system container can be accessed by all tenants since it is shared by all the tenants.

# MEDIA SERVER CAPACITIES

The following table summarizes Media Server capacities.

**Table 4: Media Server Capacities**

|  | CAPACITY |
|---|---|
| Media Servers in one OAS system | 5 |
| IP Media Ports per Media Server IP Media Server does not reject new calls, if the number of calls simultaneously handled by it, exceeds 100. IP Media Server however logs appropriate warning in the log file. | 100 (If the media server is separate. 60 if the whole OAS is installed on one server) |
| IP Media Ports per OAS | 500 |

# OAS MAINTENANCE TOOL

OAS Maintenance Tool (OMT) is an MMC snap-in that provides the following functions:

- Displays the topology of the OAS system

- Shows the status of each OAS component

- Enables the user to start or stop OAS components

- Enables the user to obtain license management information

- Enables the user to set Trace Flag on or off

## OAS CONFIGURATION MANAGER

The OAS Configuration Manager is an MMC snap-in that provides administrative controls required to configure:

- Tenant Administration ☐ only allowed for a tenanted installation.
- Basic Services
- Network Resource Manager
- Licensing
- CTI Servers: Call Control Server, Media Server
- Basic Virtual Devices
- Play Messages
- Language Libraries
- ASR Packages

Multiple instances of the Configuration Manager application are supported but only one user at the time is allowed to modify the configuration data.

## SITE DATA COLLECTION

The Site Data Collection utility captures information from the OAS, MiCC Enterprise and Enterprise License Manager (ELM) installation files that are necessary to identify system problems.

## SERVICE TOOLS

The service tools consist of:

- Media Port Activity Monitor.

  This tool captures media service events (for example ASR, TTS, Sound player and so on) allowing you to view and track these activ- ities as they occur.

- Trace Viewer.

  This tool is used to search and view specific OAS trace file information pertaining to calls and system events.

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# MITEL DAEMON

Each system that runs one or more OAS components will have an Mitel Daemon, that is run as a Windows Service. Mitel Daemon interacts with the OAS Start Stop Service (SSS), which is launched during system startup and ensures the high availability of SSS.

Mitel Daemon also interacts with NRM, Call Control Server, Media Server, Alarm Service, OTS and PDC. These OAS components are registered with their respective daemon during start up and are available over the network.

# OAS CLIENT LIBRARY

OAS client applications use software module **OAS_CSTA32.DLL** or **OAS_CSTA32_13.DLL** to access telephony services and media services. The OAS client library accepts service requests and delivers responses and events to client applications. The supported services, responses and events are provided in table 1 Event Channels on page 8.

**Note**: OAS client library must exist on every system running OAS client application(s).

## SUPPORTED DEVICES

CSTA refers to a device as an object that can be monitored by an application program. OAS supports the monitoring of the following types of devices:

- Digital Telephone Set (DTS)

- Analog Telephone Set (ATS)

- Cordless Extension (CXN)

- Channel Associated Signaling (CAS) line

- IP Extension (IP)

- Remote Extension (RXN)

- Virtual Extension (VE)

- Freeset extension

- Dect extension

- Automatic Call Distribution (ACD) group

- Computer Telephony Integration (CTI) group

- Basic Virtual Device (BVD)

Each device has a unique directory number. The requests and events supported by each device depend on its type, and is described in the following paragraphs.

### Digital Telephone Set (DTS)

Each DTS has an Own Directory Number (ODN) and, as an option, may be configured with a number of Additional Directory Numbers (ADNs) on programmable function keys. The OAS client application can monitor only the ODN on a DTS device. If the monitor start request is successful, the DTS being monitored by the client application using ODN can have **three** line appearances, which can handle up to three calls simultaneously (two calls in Hold State and one active call).

### Monitoring Logical DTS Devices

The MX-ONE has the capability to define a logical DTS, which has a reserved port but no physical device associated with it. Logical devices can be useful when a physical telephone and human intervention is not required for call handling. For example, a logical device may be used as a holding place for incoming calls until the calls can be routed to an available live agent's telephone.

### Analog Telephone Set (ATS)

An ATS may have up to three calls at any one time. In addition to the original incoming or outgoing call on an ATS, the ATS may initiate an inquiry or receive a call waiting call that will be presented to the ATS as a call waiting tone. When an ATS user initiates an inquiry by either hook-flash or pressing the "R" button, a held event is generated for the original call and the new inquiry call generates a service-initiated event. When an ATS receives a call waiting call, a delivered event for the new call is generated. All call events generated for DTS-type devices also are generated for ATS type devices.

### Cordless Extension (CXN) Devices

CXN devices operate exactly the same way as Analog Telephone Sets in terms of generated events.

### Channel Associated Signaling (CAS) Devices

CAS devices operate exactly the same way as Analog Telephone Sets in terms of generated events.

### SIP extensions

SIP devices operate exactly the same way as Digital Telephone Sets in terms of services and events.

### Mitel propriety IP Extension (IP) Devices

IP devices operate exactly the same way as Digital Telephone Sets in terms of services and events.

### Remote Extension (RXN) Devices

RXN devices operate exactly the same way as Analog Telephone Sets in terms of services and events.

**Free Seating, Virtual Extension (VE) Devices**

Free Seating (Virtual Extension) devices operate exactly the same way as the devices from which a free seating extension logs-on.

**ACD and CTI Groups**

Automatic Call Distribution (ACD) and Computer Telephony Integration groups (CTI) are associated with a directory number, a queue of a certain size, and a number of ACD agents, which are ADNs programmed on Digital Telephone Sets which can be monitored in the MX-ONE Tele- phony switch.

A CTI group is a special type of ACD group that has a queue associated with it, but may not have any associated agents.

For an ACD or CTI group to be monitored, the directory number of the group must be stated in the monitor start request. A queued event is generated when no ACD agents are available and the call is queued. A diverted event is generated when an ACD agent is selected for an incoming call. A connection-cleared event is generated when the caller disconnects while still in the queue (for example abandoned call queue), if no diverted event is received for that call.

An application may invoke a divert call request when there is a call in queue. To maintain queue position, the divert call request has optional private data specifying that the position should be maintained when the call returns to the queue.

The client application requesting the divert call service on groups will receive a positive response only when the completion of the request to the exact specified destination is guaranteed; otherwise, the application will receive a negative response with the appropriate cause.

**Basic Virtual Devices**

A Basic Virtual Device (BVD) is an extension to the concept of physical and logical devices. A BVD has call control as well as media service capabilities. OAS allows monitoring and controlling of a BVD like any other physical or logical device.

The BVD corresponds to at least one directory number, which is provided as a service number to the customer. When the customer makes a call to this service number, OAS presents this to the client application monitoring the BVD as a call to the BVD. The application can now perform call control and media service functions.

NRM monitors all CTI groups that are configured to receive calls for BVDs.

# INTER-APPLICATION COMMUNICATION DEVICE

An Inter-Application Communication Device (ICD) enables NRM Client applications to communicate with each other. The communication messages are directed through NRM as shown in figure below.
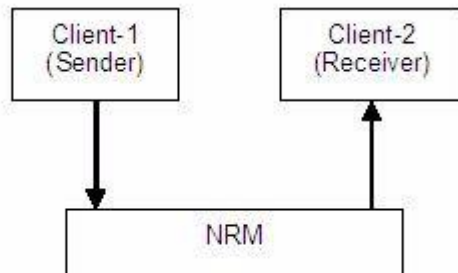


**Figure 3:  Inter-Application communication**

The client applications use ICD to send and receive messages asynchronously. The sender application sends messages to an ICD which is received by applications monitoring the ICD.

ICD is created by the sender application by starting a monitor on a non-existent ICD. If a message is attempted to be sent before monitoring ICD, a negative confirmation event is returned. Multiple applications can pick up a message from a particular ICD if they are monitoring it.

Any text message up to maximum size of 512 bytes is supported.

**Note**: The feature is limited to applications connected to the same NRM. Applications connected to different NRM cannot use the ICD feature.

# SERVICES, RESPONSES, AND EVENTS

OAS supports the TSAPI programming interface and provides ECMA CSTA telephony call control services, call/device monitoring services, query services, and corresponding responses and events. Further, it extends TSAPI to provide media services.

See Table 8 OAS services, responses, and events on page 30 for a list of supported and unsupported services, responses, and events.

**Table 5: OAS services, responses, and events**

| SERVICE/RESPONSE/ EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Alternate Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Alternate Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Answer Call service | Yes | No | No | Yes | | Yes | No | Yes Resources should be allocated to the call that is alerting at BVD; otherwise the call cannot be answered successfully. |
| Answer Call response | Yes | Yes | Yes | Yes | | Yes | No | Yes |
| Call Completion service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Call Completion response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Clear Connection service | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Clear Connection response | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Conference Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Conference Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Consultation Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Consultation Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Deflect Call service | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

| SERVICE/RESPONSE/ EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Deflect Call response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Hold Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |

| SERVICE/RESPONSE/ EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Hold Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Make Call service | Yes | Yes[2] | Yes[2] | Yes | Yes | Yes | No | Yes[3] |
| Make Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Pickup Call service | No | No | No | | | | No | No |
| Pickup Call response | No | No | No | | | | No | No |
| Group Pickup Call service | No | No | No | | | | No | No |
| Group Pickup Call response | No | No | No | | | | No | No |
| Reconnect Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Reconnect Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Retrieve Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Retrieve Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Transfer Call service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Transfer Call response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Query Do Not Disturb service | Yes | Yes | Yes | | | | No | No |
| Query Do Not Disturb response | Yes | Yes | Yes | | | | No | No |
| Query Device Info service | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Query Device Info response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Query Device Agent State service | Yes | No | No | Yes | | | | No |
| Query Device Agent State response | Yes | No | No | Yes | | | | No |
| Query Forwarding service | Yes | Yes | Yes | Yes | Yes | Yes | No | No |

| SERVICE/RESPONSE/ EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Query Forwarding response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Set Do Not Disturb service | Yes | Yes[2] | Yes[2] | | | | No | No |
| Set Do Not Disturb response | Yes | Yes | Yes | | | | No | No |
| Set Forwarding service | Yes | Yes | Yes | | | | No | No |
| Set Forwarding response | Yes | Yes | Yes | | | | No | No |
| Monitor Device service | Yes | es | Yes | Yes | Yes | Yes | Yes | Yes |

| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Monitor Device response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Monitor Stop service | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Monitor Stop response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Snapshot Device service | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Snapshot Device response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Associate Data service | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Associated Data response | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Msg Diversion service | Yes1 <br><br> This service is valid only if the device is in Idle state. | Yes4 | Yes4 | Yes | Yes | Yes | No | No |
| Msg Diversion response | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Enter Account Code service | Yes4 | Yes4 | Yes4 | | Yes | Yes | No | No |
| Enter Account Code response | Yes | Yes | Yes | | Yes | Yes | No | No |
| Cancel Callback service | Yes4 | Yes4 | Yes4 | | Yes | Yes | No | No |
| Cancel Callback response | Yes | Yes | Yes | | Yes | Yes | No | No |
| Enter Authorization Code service | Yes4 | Yes4 | Yes4 | | Yes | Yes | No | No |

| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Enter Authorization Code response | Yes | Yes | Yes | | Yes | Yes | No | No |
| Press Programmable Key service | Yes3 | Yes3 | Yes3 | | Yes | Yes | No | Yes |
| Press Programmable Key response | Yes | Yes | Yes | | Yes | Yes | No | Yes |
| Send DTMF service | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Send DTMF response | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Set ACD Group Forward service | No | No | No | No | No | No | Yes | No |
| Set ACD Group Forward response | No | No | No | No | No | No | Yes | No |
| Media Services and Responses | | | | | | | | |
| Allocate Resources service | No | No | No | No | No | No | No | Yes |
| Allocate Resources response | No | No | No | No | No | No | No | Yes |
| Deallocate Resources service | No | No | No | No | No | No | No | Yes |
| Deallocate Resources response | No | No | No | No | No | No | No | Yes |
| Play service | No | No | No | No | No | No | No | Yes |
| Play response | No | No | No | No | No | No | No | Yes |
| Collect Digits service | No | No | No | No | No | No | No | Yes |
| Collect Digits response | No | No | No | No | No | No | No | Yes |
| Record service | No | No | No | No | No | No | No | Yes |
| Record response | No | No | No | No | No | No | No | Yes |
| Recognize service | No | No | No | No | No | No | No | Yes |
| Recognize response | No | No | No | No | No | No | No | Yes |
| Join Calls service | No | No | No | No | No | No | No | Yes |
| Join Calls response | No | No | No | No | No | No | No | Yes |

| SERVICE/RESPONSE | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|

| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Split Calls service | No | No | No | No | No | No | No | Yes |
| Split Calls response | No | No | No | No | No | No | No | Yes |
| Delete Media Objects service | No | No | No | No | No | No | No | No |
| Delete Media Object response | No | No | No | No | No | No | No | No |
| Set Default Container Path service | No | No | No | No | No | No | No | Yes |
| Set Default Container response | No | No | No | No | No | No | No | Yes |
| Events (Unsolicited) | | | | | | | | |
| Back in Service event | Yes | Yes | Yes | Yes | Yes | Yes | | Yes |
| Conferenced event | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Connection Cleared event | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Delivered event | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Established event | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Forwarding event | Yes | Yes | No | Yes | Yes | Yes | No | No |
| Service Initiated event | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Failed event | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Held event | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Monitor Ended event | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Network Reached event | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Originated event | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Out of Service | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Queued event | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Retrieved event | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| Transferred event | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |

| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Do Not Disturb event | Yes | No | No | Yes | Yes | Yes | No | No |
| Media Service Specific Unsolicited Events | | | | | | | | |
| Collect Digits Started event | No | No | No | No | No | No | No | Yes |
| Collect Digits Ended event | No | No | No | No | No | No | No | Yes |
| Collect Digits Failed event | No | No | No | No | No | No | No | Yes |
| Delete Media Object Completed event | No | No | No | No | No | No | No | Yes |
| Delete Media Object Failed event | No | No | No | No | No | No | No | Yes |
| Media Object Created event | No | No | No | No | No | No | No | Yes |
| Play Started event | No | No | No | No | No | No | No | Yes |
| Play Ended event | No | No | No | No | No | No | No | Yes |
| Play Failed event | No | No | No | No | No | No | No | Yes |
| Resources Allocated event | No | No | No | No | No | No | No | Yes |
| Resources De-allocated event | No | No | No | No | No | No | No | Yes |
| Resources Timeout event | No | No | No | No | No | No | No | Yes |
| Recognize Started event | No | No | No | No | No | No | No | Yes |
| Recognize Ended event | No | No | No | No | No | No | No | Yes |
| Recognize Failed event | No | No | No | No | No | No | No | Yes |
| Record Started event | No | No | No | No | No | No | No | Yes |
| Record Ended event | No | No | No | No | No | No | No | Yes |
| Record Failed event | No | No | No | No | No | No | No | Yes |
| Speech Detection Started event | No | No | No | No | No | No | No | Yes |
| Speech Detection Ended event | No | No | No | No | No | No | No | Yes |

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| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|

| SERVICE/RESPONSE / EVENTS | DTS | ATS | CXN/CAS | IP | RXN | VE | ACD/ CTI | BVD |
|---|---|---|---|---|---|---|---|---|
| Send DTMF Started event | No | No | No | No | No | No | No | Yes |
| Send DTMF Ended event | No | No | No | No | No | No | No | Yes |
| Send DTMF Failed event | No | No | No | No | No | No | No | Yes |

Table notes:

1. Resources should be allocated to the call that is alerting at BVD; otherwise the call cannot be answered successfully

2. ATS and CAS should be in Service Initiated state (off-hook) prior to invoking this service.

3. BVD will perform the Make Call service only if the resources are allocated for that call.

4. This service is valid only if the device is in Idle state.

# OAS INSTALLATION AND CONFIGURATION

Installation and configuration of OAS are described in the following documents Open Application Server Installation Instruction, Open Application Server Hardware Installation and Open Application Server Software Configuration.

# OAS SUPPORT TOOLS

OAS software comes with a number of support tools that are described in the following sections.

## NCSTA TOOL

With the NCSTA tool `ncstatool.exe` a communication stream with Application Link and Media Server can be established, so that call control services and media services can be manually executed. This tool displays services, responses and events. The tool can be used to verify Application Link and Media Server functions, and to understand more about services, responses, and events.

## ETP API TOOL

With the ETP API tool `etpapitool.exe` a communication stream with NRM can be established, so that call control services and media services can be manually executed. The tool displays services, responses, and events and can be use to verify the call control and media service functions of NRM.

# OAS LOG MONITOR

The OAS Log Monitor tool `oaslogmonitor.exe` can be used to view the content of OAS Trace Logs stored in OLM format.

# OCS MANAGER

OCS Manager is an MS command mode program that communicates directly with OCS. The `ocsmanager.exe` to view and modify OAS configuration data.

# OCS UPGRADE

The OCS Upgrade tool `ocsupgrade.exe` provides the following functions:

- Restore of OAS repository

- Upgrading of OAS 7.0 repository to OAS 9.3 repository (step by step, i.e 7.0 to 8.0, 8.0 to 8.1 and so on).

The OCS Upgrade tool restores backed-up repository data to the repository directory selected. Usually OAS configuration data is backed up manually (by copying repository files) or by using the OAS Uninstall program. OCS divides OAS configuration data into different records, based on the type of information, and stores these records in separate files with the extension `.rep`.

# MESSAGE CONVERSION TOOL

Since the VoIP Media Server can only support G.711 A-Law or Mu-Law wav files, the Message Conversion Tool converts recorded prompts and Play Messages database into a format supported by OAS. For more information, see document *Message Conversion Tool*.

# MEDIA MESSAGE TOOL

Media Message Tool (MMT), is an OAS client application with a graphical user interface that interacts with OCS. If MMT cannot connect to OCS, it will not be available for any service. MMT can be used to:

- Make an outbound call from a BVD to a physical device

- Play messages

- Record messages

For more information, see document *Media Message Tool.*

# SITE DATA COLLECTION TOOL

Site Data Collection tool captures information from the OAS, MiCC Enterprise and Enterprise License Manager (ELM) installation files, necessary to identify system problems.

# SERVICE TOOL

There are four different service tools:

**Media Port Activity Monitor**

This tool captures media service events (for example ASR, TTS and Sound player) allowing you to view and track these activities as they occur.

**Trace Viewer**

This tool is used to search and view specific OAS trace file informa- tion pertaining to calls and system events.

**OAS Log Zipper**

This is a general purpose tool which can used to compress all files matching a user specified name filter in a specified folder.

**OAS Log Unzipper**

This is a general purpose tool which can used to unzip all zip files in a specified folder.
For more information, see document *Service Tools*.

# OAS TOPOLOGY CONFIGURATION

OAS can be configured to consist of one single node and a single server or one single node and multiple servers. Changing from one _onfigure- tion to another is simple.

## SINGLE NODE, SINGLE SERVER

The configuration illustrated in Figure 3  on page 40 is recommended for systems with medium-level call traffic and media resource usage. In this configuration, all OAS service components reside in the same host.
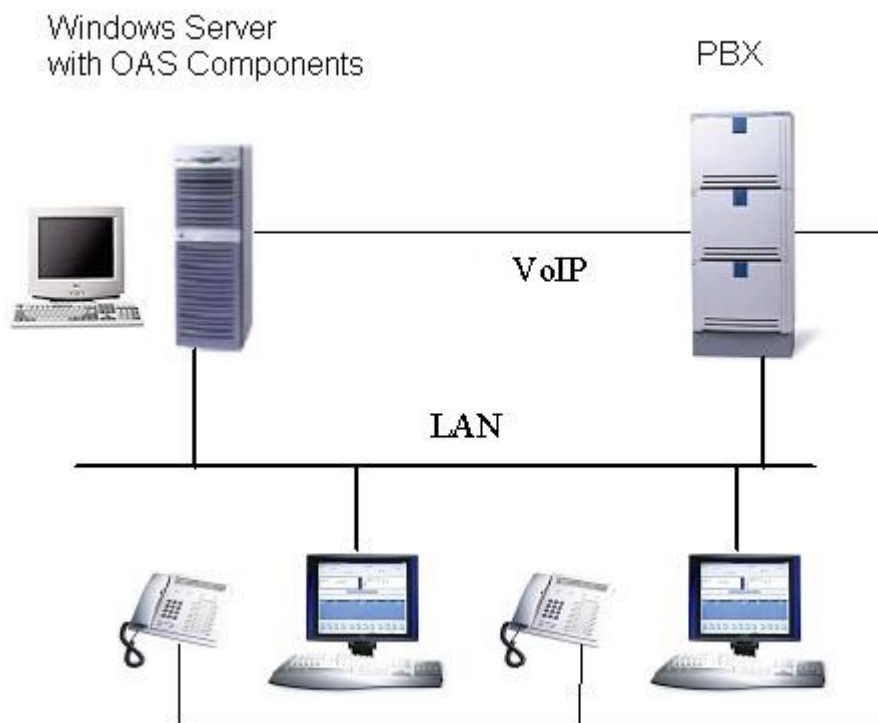


**Figure 4:  Single node, single server configuration**

## SINGLE NODE, MULTIPLE SERVERS

The configuration illustrated in Figure 4  on page 41 is recommended for systems with a moderate-level of call traffic and media resource require- ments. In this configuration:

- Network Resource Manager and Basic Services reside in one host

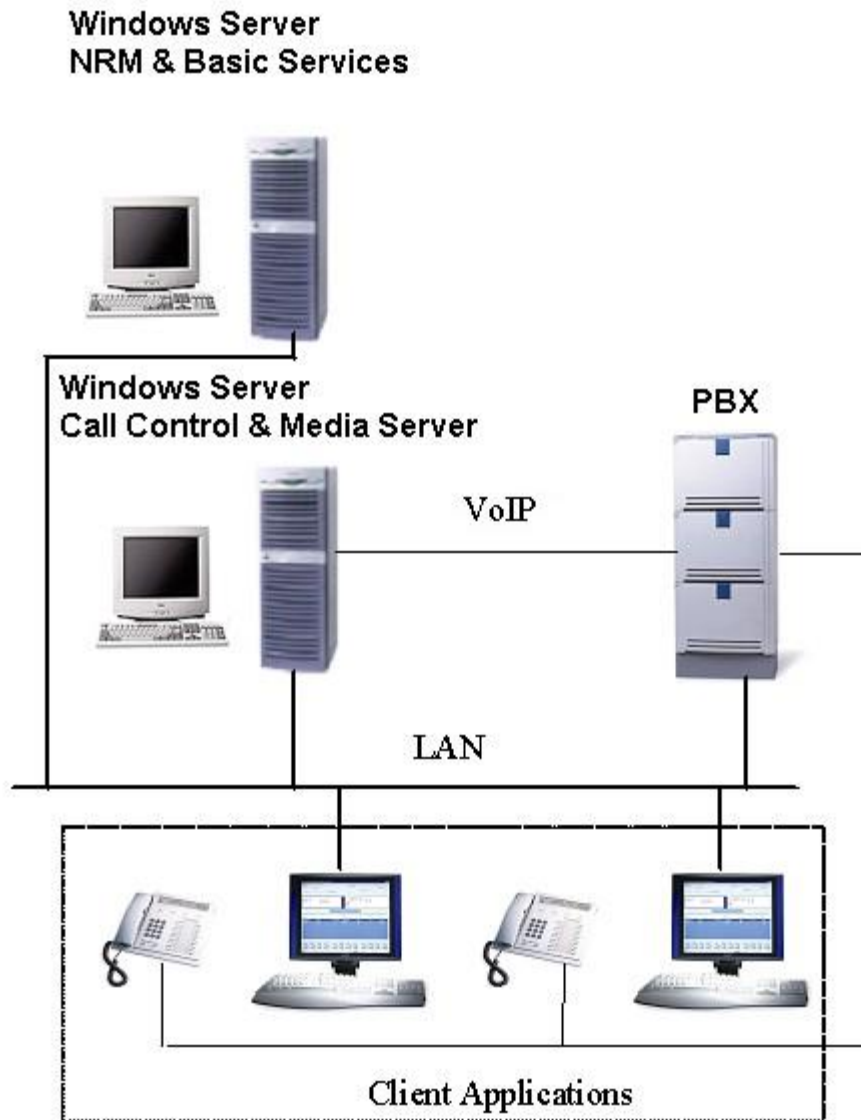- Call Control Server and Media Server reside in another host



**Figure 5:  Single node, multiple server configuration**

# SINGLE NODE, MULTIPLE MEDIA SERVERS

The configuration illustrated in Figure 6 on page 42 is recommended for systems with high-level call traffic and media resources requirements. In this configuration:

- Network Resource Manager and Basic Services reside in one host

- Call Control Server and Media Server reside in the Network Resource Manager and Basic Services host or in second host

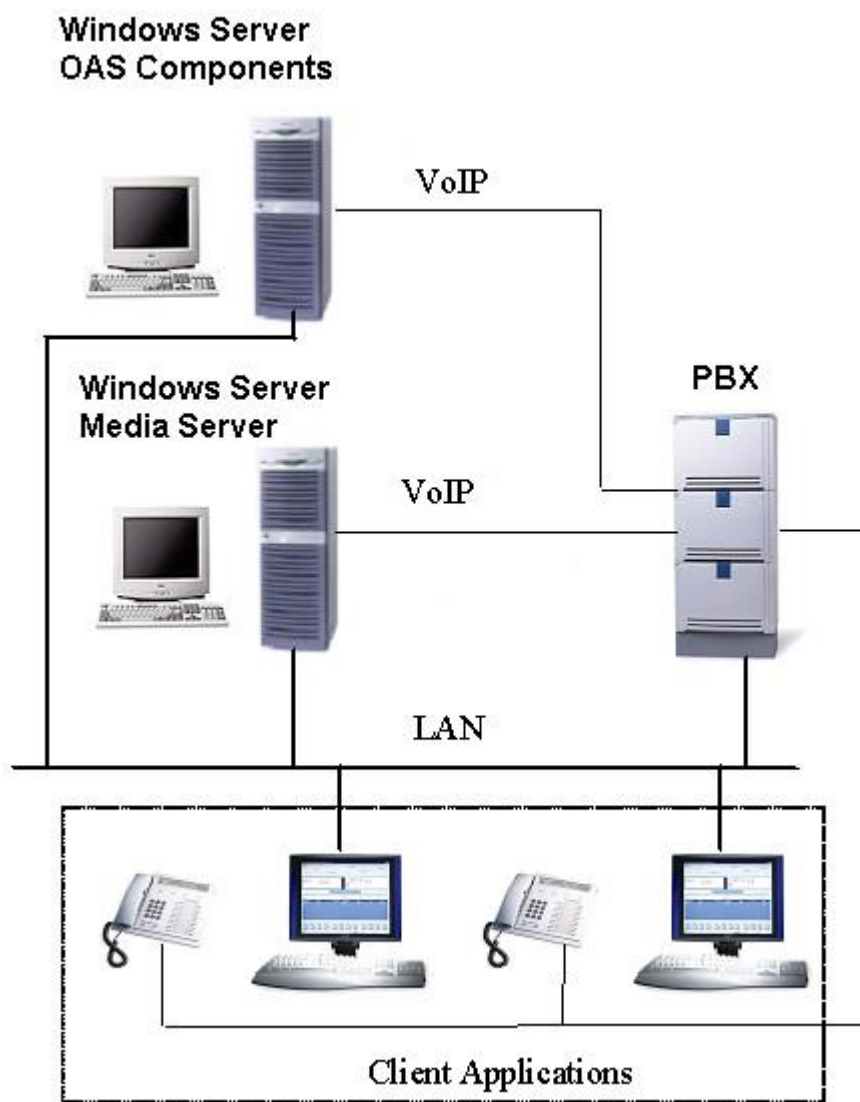- An additional Media Server resides in another host



**Figure 6:  Single node, multiple media server configuration**

# CAPACITIES

See table 9 Capacity on page 43 for general capacity associated with OAS.

**Table 6:  Capacity**

| | |
|---|---|
| Call handling per OAS | 10,000 BHCC (Busy Hour Call Completion) |
| OAS systems connected to the PBX using AppLink  For a single site, not Virtual  Contact Center. | Up to 4 |
| Maximum sites in a Virtual Contact Center | 20 (with one OAS each) |
| Maximum OAS systems per Virtual Contact Center | 20 |
| Maximum IP media ports per IP media Server when installed on OAS server | 60 |
| Maximum IP media ports per stand-alone IP media Server | 100 |
| Number of IP media servers per OAS | 5 |